BeneTerra Pty Ltd **Level 4, 300 Ann Street** **Brisbane, Queensland 4000**	NSW EPL 21343 – Mobile Waste Processing
	DOCUMENT Plan

Pollution Incident Response Management Plan (PIRMP)

AUTHOR(S) Grace Jamieson

BeneTerra	PROJECT NO.	DISC	TYPE	DOC NO.
			PLN	BT-C-EHS-PLN-PIRMP

REVISION	DATE	REASON(S)	BY	CHK	APR	CLIENT
A	13/06/2024	Draft issued for review	RVN	SH,GJ	SH	
0	12/08/2024	Issued for use	GJ	SH	SW	

AUTHORISATION

The delivery of this plan to the Client has been authorised by and on behalf of BeneTerra Pty Ltd.

Authorised signatory	Print name	Title	Date
	Steve Winters	General Manager	13/08/2024

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1 Purpose

BeneTerra Pty Ltd holds an Environment Protection Licence with the NSW Environment Protection Authority (EPA) for mobile waste processing (VIN:6FH9079DAPM004532). As per the *Protection of the Environment Operations Act 1997* (the POEO Act), the holder of an Environment Protection Licence must prepare, keep, test and implement a pollution incident response management plan (PIRMP) that complies with Part 5.7A of the POEO Act in relation to the activity to which the licence relates.

If a pollution incident occurs in the course of an activity so that material harm to the environment (within the meaning of section 147 of the POEO Act) is caused or threatened, the person carrying out the activity must **immediately** implement this plan in relation to the activity required by Part 5.7A of the POEO Act.

A copy of this plan must be kept at the licensed premises, or where the activity takes place in the case of mobile plant licences and be made available on request by an authorised EPA officer and to any person who is responsible for implementing this plan.

Parts of the plan must also be available either on a publicly accessible website, or if there is no such website, by providing a copy of the plan to any person who makes a written request. The sections of the plan that are required to be publicly available are set out in section 74 of the Protection of the Environment Operations (General) Regulation 2022.

Note: This plan has been developed in accordance with the *Protection of the Environment Operations Act 1997* and the Protection of the Environment Operations (General) Regulation 2022.

2 Environment Protection Licence (EPL) Details

Table 1 Licensee Details

Name of licensee:	BeneTerra Pty Ltd ABN: 32 147 534 503
EPL number:	21343
Premises name and address	Mobile waste processing VIN: 6FH9079DAPM004532 VIN:
Company contact details	Name: Steve Hillsdon Position: Operations Manager Business hours contact number: 0414 452 814 After hours contact number: 0414 452 814 Email: steve.winters@beneterra.com.au
Website address:	www.beneterra.com
Scheduled activity on EPL:	Mobile waste processing
Fee-based activity on EPL	Mobile waste processing

Table 2 Pollution incident - person(s) responsible

PIRMP Activation	**Name of person responsible**: Steve Hillsdon **Position or title:** Operations Manager **Business hours contact number/s**: 0414 452 814 **After hours contact number/s**: 0427 921 977 (24hr on call number) **Email:** steve.hillsdon@beneterra.com.au
PIRMP activation alternate	**Name of person responsible**: Rory van Niekerk **Position or title:** Project & Support Engineer **Business hours contact number/s**: 0499 170 899 **After hours contact number/s**: 0427 921 977 (24hr on call number) **Email:** rory.vn@beneterra.com.au

Table 3 Notifying Relevant Authorities

Notifying relevant authorities' responsible person	**Name of person responsible**: Steve Hillsdon **Position or title:** Operations Manager **Business hours contact number**: 0414 452 814 **After hours contact number**: 0427 921 977 **Email:** steve.hillsdon@beneterra.com.au

Table 4 Response management person

Managing response to pollution incident	**Name of person responsible:** Steve Hillsdon **Position:** Operations Manager **Business hours contact number:** 0414 452 814 **After hours contact number:** 0427 921 977 **Email:** steve.hillsdon@beneterra.com.au

3 Incident notification

3.1 Notification of relevant authorities

Relevant authorities requiring notification may include:

Table 5 Authorities requiring notification

Fire and Rescue NSW / Rural Fire Service	Contact number:	Emergencies - 000
EPA	Contact number/s:	131 555
NSW Health	Relevant Area Health Service:	Project Specific
	Contact number:	1800 022 222 (Health Direct)
SafeWork NSW	Contact number:	131 050
WorkCover Queensland	Contact number:	1300 362 128
Local authority (Project Specific)	Contact number:	Project Specific

See Table 6 for person(s) responsible for identifying the local authority and nearest public health unit per project.

Table 6 Person responsible for identifying local details

Identification of local authority and nearest public health unit	**Name of person responsible:** Steve Hillsdon **Position:** Operations Manager **Business hours contact number:** 0414 452 814 **After hours contact number:** 0427 921 977 **Email:** steve.hillsdon@beneterra.com.au

3.2 Notification of neighbours and the local community

BeneTerra will conduct a site specific risk assessment to identify neighbours including sensitive receptors. BeneTerra utilises the following tools to identify neighbours and sensitive receptors.

- Consultation with landfill operator.
- NSW Planning Portal
- Google Earth

Members of the local community will be notified by the Landfill Operator via phone call if an incident has a direct impact on them.

4 Description and likelihood of hazards

The following hazards to human health or the environment are associated with mobile waste processing as per the licence. A plant risk assessment is undertaken for each piece of equipment listed on the mobile licence (Appendix A). See below list of hazards inspected as part of the plant risk assessment:

- Leaks and spills
- Access – security
- Entanglement
- Impact and cutting injuries
- Shearing
- Pressured content
- Electricity
- Ergonomics
- Radiation
- Noise
- Vibration
- Friction
- Suffocation
- Condition
- Slips/Trips
- Falls
- Fire and explosions
- Temperature/moisture
- Stack emissions
- Exposure

Refer to the plant risk assessments in Appendix A for each BeneVap machine included in this licence which addresses the hazards, their likelihood and control measures in detail.

4.1 Pre-emptive actions to be taken

The following pre-emptive actions will be taken to minimise or prevent any risk of harm to human health or the environment arising from the activity.

- The BeneVap unit is Type B certified, manufactured to AS3814 requirements and maintained monthly using maintenance form.
- The BeneVap unit has a BCU controlled combustion process for the gas safety critical aspects, and additional PLC process safety control in place. These safety controls are highlighted in the Control Logic diagram of the unit that can be requested at any time.
- Any gas connection works are approved by a certified gas fitter.
- BeneVap Technicians carry gas detectors when working on site around gas.
- BeneVap Technicians abide by the site communication protocols
- SWMS's, SOP's, Step 7's, risk assessments and permit to work systems are all part of the BeneVap Technician's role to ensure safety when setting up / commissioning / packing down / performing maintenance on the BeneVap unit.
- All equipment is bunded to site requirements – BeneVap unit, discharge tank, diesel fuel supply, chemicals on site such as antifoaming agent / oil.
- Stack emissions must meet the licence requirement limits, and the stacks are typically 6m above ground level.
- Handrails are installed where required to protect the BV Technician when working on the roof.
- Signage on the BeneVap CV and stacks to identify hot surfaces, as well as remote control signage.
- Audible discharge siren installed to warn people in the near vicinity when a discharge takes place. Discharges vary in volume from 100 L every 30-60min and up to 1,000 and 3,000 L once a week typically.
- Equipment is installed in a naturally ventilated area.

5 Inventory of pollutants

An inventory of potential pollutants used in carrying out the activity are included in Table 7.

Table 7 Inventory of pollutants

Location/tank	Maximum quantity	Contents	Further details
IBC 1	1,000 L	Used cooking oil	Process foaming control.
Drum 1	200 L	Antifoaming agent – Silfax D3	Process foaming control.
Drum 2	20 L	Oil	Air compressor servicing.
Drum 3	20 L	Oil	Gas blow servicing.
Discharge tank	10,000L	Residual leachate	Holding tank for residual leachate.
Leachate pond/tank	Site Specific	Landfill leachate	Managed by Landfill Operator.

6 Safety equipment

The following summary of safety equipment is applicable to each BeneVap covered by the mobile licence.

- All equipment is bunded to site requirements – BeneVap unit, discharge tank, diesel fuel supply, chemicals on site such as antifoaming agent / oil.
- The BeneVap unit has a BCU controlled combustion process for the gas safety critical aspects, and additional PLC process safety control in place. These safety controls are highlighted in the Control Logic diagram of the unit, see Appendix B.
- The BV unit PLC controls gas / air ratio using an O2 trim sensor to ensure the combustion process runs lean with excess air to ensure complete combustion of the gas in the process.
- BeneVap Technicians carry gas detectors when working on site around gas.
- BeneVap Technicians carry 2-way radios on site for communication to site protocol.
- BeneVap Technicians work according to site and BeneTerra work permits and use the necessary safety equipment for these works – e.g. use a harness if a handrail is not in place for working at heights, use a gas detector when working in a confined space.
- BeneVap Technicians use all necessary PPE – steel capped boots, long sleeve Hi-Vis shirts, gloves, hearing and eye protection

7 Communicating with neighbours and the local community

The local community will be notified by the Landfill Operator prior to the activity commencing including details about what the activity is and its duration. They will be provided with contact information to report any complaints.

Develop any specific information that could be provided to the community, so it can minimise the risk of harm:

The following information can be communicated to the community prior to the activity commencing in the form of a letter box drop if required by the landfill operator.

What is leachate?

Landfill leachate is water that percolated through waste. The landfill s carefully designed and constructed in accordance with best practice to ensure leachate is contained and treated.

How is leachate managed at *<insert site>*?

<Insert information about how leachate is managed at the specific site.>

Managing leachate is an important step in ensuring the efficiency of the landfill gas extraction system. The BeneVap system improves leachate management process and helps regulate seasonal changes.

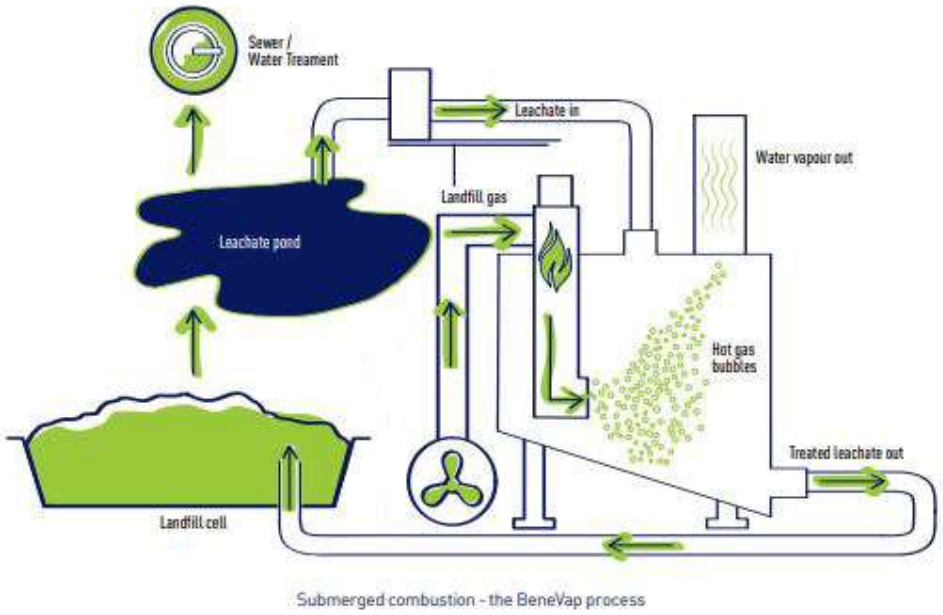


Figure 1 Submerged combustion process diagram

What is BeneVap?

BeneVap is innovative and sustainable way to reduce leachate volumes permanently.

The BeneVap uses submerged combustion technology to form high temperature air bubbles that vaporise the water component in leachate on contact. The leachate in the vessel does not boil and is only heated to around 85^{o}C. The heating speeds up the removal of ammonia from the leachate.

The system is fully mobile and can be mobilised to a landfill site quickly during periods of high rainfall when additional leachate storage capacity may be required.

Where is BeneVap used?

BeneVap has been used on landfills in Australia, USA and New Zealand for many years to treat leachate.

Exactly what is proposed for *<insert site>?*

<Insert project specific details regarding the use of BeneVap to reduce leachate volumes>

8 Minimising harm to persons on the premises

The following arrangement will be in place to minimise the risk of harm to any persons who are on present where the BeneVap is operating:

- Harm to persons on the premises has been minimised by design of the equipment and site setup. In the unlikely event of an emergency or potential threat to human health on the BeneVap unit site, the following arrangements have been made:
    - Project Specific Emergency Response Plan
    - E-Stops on BeneVap.
    - BeneVap 24-hour on call phone number: 0427 921 977
    - Minimise access to the Site via controlled access.
    - Ensure no site offices are in the immediate vicinity of the BeneVap

9 Maps

A site-specific layout map will be developed for each project. The maps will include the following information:

- Location of the project.
- Surrounding area likely to be affected by a pollution incident
- Location of potential pollutants
- Location of any stormwater drains

10 Actions to be taken during or immediately after a pollution incident

In the case of a reportable incident occurring the following steps will be followed:

- Switch off and isolate BV unit and gas / diesel skid, leachate supply, power supply with assistance from site personnel.
- BeneTerra to notify Landfill Operator of the incident occurring as soon as it had been identified as per the site specific emergency management plan.
- Landfill Operator to notify neighbours / sensitive receptors if they have been affected.
- BeneTerra staff to complete internal incident report form within 48 hours of the incident occurring.
- BeneTerra to notify relevant authorities of the incident as per this PIRMP.
- BeneTerra to determine exact cause of the pollution incident and control measures that can be put in place to prevent it from happening again.
- BeneTerra to apply any changes required using the Management of Change Protocol and relay the changes made to the Landfill Operator.

The design of the BeneVap and site set up aims to reduce any identified risks to human health. The BeneVap unit has a BCU controlled combustion process for the gas safety critical aspects, and additional PLC process safety control in place. These safety controls are highlighted in the Control Logic diagram of the unit (Appendix B). If a risk is identified BeneTerra will inform the Landfill Operator and advise them of the risk and the steps to be taken to mitigate that risk:

- An identified risk will be managed according to the hierarchy of controls:
    - Eliminate
    - Substitue
    - Engineering controls
    - Administrative controls
    - Personal Protective Equipment

- BeneTerra will apply any changes required using BeneTerra's Management of Change Procedure and relay the changes to the Landfill Operator.

In the event of an incident BeneTerra will undertake the following actions to combat pollution caused by the incident.

Spills

Typically, the most common cause of pollution to the environment with a BeneVap unit is a raw or residual leachate spill on the site; this can occur during the following scenarios:

- If a leak develops in the leachate supply line from the supply source to the BeneVap unit nearby, the result will be a raw leachate deposit onto the ground where the leak occurs.
- If the discharge tank is not emptied and the Hi float switch does not activate and shut the BeneVap unit down, concentrated leachate may spill over into the discharge tank bund.
- If the discharge tank bund submersible pump does not activate to remove the leachate in the bund, concentrated leachate will be spilt onto the ground around the bund perimeter.
- Should all the safety precautions above not activate, the BeneVap unit can continue running and result in between 2,400 to 3,600 L of concentrate being spilt in a 24-hour period, or a maximum of 5,400 to 6,600 L of concentrate being spilt if a full discharge takes place during that 24-hour period.

The BeneVap units are visited daily by the Landfill Operator, any large spills are usually detected before a 24-hour period. If spills occur, absorbent materials or soil are used to soak up the spilt leachate/residual in the topsoil. The waste is then removed from the site and returned to the correct area of the landfill. Spill kits will be available at the Site.

Noise

Temporary barriers can be installed for noise attenuation if noise pollution becomes an issue at the site.

11 Coordinating with persons

The following procedures are to be followed for coordinating with the authorities or persons who have been notified.

- BeneTerra incident management procedure (BT-C-EHS-PRD-019)
- BeneTerra incident report form (BT-C-EHS-FRM-007).
- BeneTerra incident investigation form (BT-C-EHS-FRM-001).
- Notify the necessary authorities as per this PIRMP via phone call and email if required.
- Make a record of the incident and related phone calls in the BeneTerra pollution register for the job.
- Notify the Landfill Operator of the communications with the relevant authorities and the outcome of the communications and any action items that need to be attended to subsequent to the communications.

Table 8 Contacts for all communications

Contact 1	**Name:** Steve Hillsdon **Position:** Operations Manager **Business hours contact number**: 0414 452 814 **After hours contact number/s**: 0414 452 814 **Email:** steve.hillsdon@beneterra.com.au
Contact 2	**Name:** Grace Jamieson **Position:** Project Manager **Business hours contact number**: 0413 092 738 **After hours contact number/s**: 0413 092 738 **Email:** grace.jamieson@beneterra.com.au

12 Staff Training

Staff are to be trained in the contents and procedures related to the PIRMP prior to any activities at the Site.

Objectives:

- Workers are aware of their responsibilities under the PIRMP.
- Workers are aware of the specific procedures to be followed in the event of pollution occurring.
- Workers are aware of the key contacts applicable to this PIRMP.

13 Testing and updating of the PIRMP

A PIRMP test register below will be utilised for the BeneVap units operating under the mobile licence as per the below example.

The testing of the PIRMP will take place every 12 months or within one month of any pollution incident that caused or threatened material harm to the environment.

Tests will include two BeneTerra staff participating in working through the PIRMP together to ensure that the plan is accurate and up to date, and capable of being implemented effectively in the working environment.

All tests will be recorded on the PIRMP test register, along with the test dates, staff member names performing the test and a notes section on any shortcomings or areas that need correction in the PIRMP, as well as a column for the responsible staff member to sign off on the changes required being effectively implemented in the PIRMP.

Table 9 PIRMP testing details

Date tested	Tested by	Details of test	Finding of test, including issues identified	Next scheduled testing date (must be within 12 months of current test)

APPENDIX A

PLANT RISK ASSESSMENTS

Plant and Equipment Risk Management Form

1. Hazard Management Details – General		
Plant/Equipment Item: BV300	**Make/Model No.: BV300-BV2**	**Serial No.: RHONDA**
Name of Person(s) Conducting Inspection: Rory van Niekerk		**Date Conducted:** 29/07/2024
		**Summary of Key Risks:** • Leaks and Spills • Access - Security • Entanglement • Impact and Cutting Injuries • Ergonomics • Noise • Slips, Trips and Falls • Fire and Explosion • Electrocution • Other (Fumes)

Risk Assessment Signoff		
Authorised By: Stephen Hillsdon	Signature:	Date: 29/07/2024

Plant and Equipment Risk Management Form

2. Documentation		
Relevant Legislation/Standards	**Y / N**	**Comments**
Is plant required to be registered?	Y ☒ N☐	The BV300 semitrailer must be registered for road use. The BV300 must have a Type B Gas Certification when the burner is fuelled by Natural Gas or LFG. LPG gas bottles must have a Certificate of Compliance. The gas works supplying the BV300 must have a gas works certificate.
Is a user license required?	Y ☒ N☐	No statutory license is required to operate the BV300, however, training and certification is required to operate the BV300 (run and managed by BeneTerra with a certification / verification of competency requirement to perform works on the BV300). A truck driver's licence is required to transport the BV300 unit.
Key reference material:		
Plant Documentation	**Y / N**	**Comments**
Are operator's manuals accessible?	Y ☒ N☐	A copy of the operation manual is in the BV300 on-board filing box.
Is this a restricted use item?	Y ☐ N☒	
Does this item require safe use documents/test?	Y ☒ N☐	BV300 Project Risk Assessment; BV300 SOP 010; BV300 Setup and Commissioning Form; BV300 Maintenance Checklist; Genset pre-start form.

3. Hazard Identification						
Hazards Inspected		**Risk Assessment**			**Description of Risk**	**Control Measures**
		Conseq	Likeh'd	Risk Level		
LEAKS AND SPILLS	Y ☒ N☐	Major	Possible	High	• Leaks and spills of the BV300 treated solution from the Concentration Vessel (CV), Discharge Tanks, pumps, valves, pipework, fittings and when being discharged to the Discharge tank.	• Bunded site covering the BV300 CV as well as the Discharge tank. • Inspection of seals prior to connecting hoses; Ensure correct fittings in place; Regular site inspection/maintenance.
ACCESS - SECURITY	Y ☒ N☐	Major	Possible	High	• Unauthorised access.	• If required, BV300 area is fenced for the duration of the project with a 6' high fence that has a locked gate.

Plant and Equipment Risk Management Form

ENTANGLEMENT Can anyone's hair, clothing, gloves, cleaning brushes, tools, rags or other materials become entangled with moving parts of the plant or materials?	Y ☒ N☐	Major	Unlikely	Low	• Loose clothing, long hair, gloves and other material may become entangled in moving parts of the BV300 such as the blower motor drive shaft, although this is unlikely.	• Make sure clothing, gloves, hair or other such items are kept clear of moving parts of the BV300 when operating. • Guards installed to isolate moving parts where practical • When performing maintenance BV300 power is to be isolated (lock-out and tag-out).
Impact and Cutting Injuries Can anyone be crushed/cut/struck etc. due to:					• During setting up of the site objects such as handrails may be dropped from the top of the BV300 roof. • BV300 may tip over during an extreme storm / hurricane on an uneven surface. • During testing, commissioning, inspection, operation, maintenance, cleaning or repair, impact and cutting injuries are possible due to the many varied components that form the BV300.	• All unnecessary people have been removed from BV300 area. If required, BV300 area is fenced for the duration of the project with a 6' high fence that has a locked gate. • Lifting operations on site will require a lifting permit according to BeneTerra and site requirements. • Ensure the site surface is level. No staff on site during an extreme storm / hurricane, remote operation. • Make sure operator does not perform any cleaning, maintenance or repair until the BV300 is turned off and isolated (by lock-out and tag-out) and any moving parts have come to a complete stop. Isolating power will prevent remote start-up during these activities.
• Material falling off the plant?	Y ☒ N☐	Major	Possible	Extreme		
• Uncontrolled/unexpected movement of plant/load?	Y ☐ N☒					
• Lack of capacity to slow, stop or immobilize plant?	Y ☐ N☒					
• The plant tipping or rolling over?	Y ☒ N☐	Major	Possible	High		
• Parts of the plant disintegrating or collapsing?	Y ☐ N☒					
• Contact with moving parts during testing, commissioning, inspection, operation, maintenance, cleaning or repair?	Y ☒ N☐	Major	Unlikely	High		
• Being thrown off or under the plant?	Y ☐ N☒					
• Contact with sharp or flying objects? (e.g. work pieces being ejected)	Y ☐ N☒					
• The mobility of the plant?	Y ☐ N☒					
• Inappropriate parts and accessories being used?	Y ☐ N☒					
• Other	Y ☐ N☐					

Plant and Equipment Risk Management Form

Hazards Inspected		Risk Assessment			Description of Risk	Control Measures
		Conseq	Likeh'd	Risk Level		
SHEARING Can anyone's body parts be sheared between two parts of plant, or between a part of the plant and a work piece or structure?	Y☒ N☐	Major	Possible	Extreme	• Getting sheared between the BV300 trailer and the prime mover when mobilising and demobilising.	• All unnecessary people have been removed from BV300 area. • Only licenced operators to drive the prime mover. • Spotter (if required) to stand clear of the prime mover and BV300 trailer. • Positive comms between the driver of the prime mover and the spotter (if required).
PRESSURISED CONTENT Can anyone come into contact with fluids or gases under high pressure, due to plant failure or misuse of the plant?	Y ☒ N☐	Major	Unlikely	Extreme	• Failure of air compressor and related pipework and fittings (1,000 kPa operating pressure). • Failure of methane and propane gas train pipework and components (expected maximum pressure of 200 kPa). • Failure of LPG gas bottles.	• Perform preventative maintenance on air compressor and all gas trains. Pressure gauge installed in the pipework, check for corrosion signs; PPE used while operating machinery. Pipelines made in accordance with relevant certificates (Carbon steel) and have a max operating pressure (1,500 kPa) greater than max operating pressure of air compressor (1,000 kPa). • BV300 built to AS3814: Industrial and Commercial Gas Fired Appliances; Perform maintenance as per BV Maintenance Checklist. • BV300 built to AS3814: Industrial and Commercial Gas Fired Appliances; LPG gas bottles, pipework and fittings visually inspected for integrity when received and during operational checks and maintenance; all ignition sources acceptable distance from vessel site.

Plant and Equipment Risk Management Form

ELECTRICITY Can anyone be injured or burnt due to:					• BT Operators may gain access to electrical panels for a general visual inspection of the panel internals and integrity when mobilising and performing other preventative maintenance works or extra low voltage work. • Electrocution from damaged submersible pump electrical cord in the discharge tank solution if applicable.	• Perform visual checks only when the main power supply to BV300 has been isolated (using lock-out and tag-out). This will also remove remote control whilst panels are inspected. • All electrical cord items to be tested and tagged every six months. Inspect submersible and feed pump electrical cords during maintenance.
• Live electrical conductors? (*e.g.* exposed wires)	Y ☐ N☒					
• Working in close proximity to electrical conductors?	Y ☐ N☒					
• Access to electricity?	Y ☒ N☐	Major	Unlikely	Extreme		
• Damaged or poorly maintained electrical leads, cables or switches?	Y ☒ N☐	Major	Unlikely	Extreme		
• Water near electrical equipment?	Y ☒ N☐	Major	Unlikely	Extreme		
• Lack of isolation procedures?	Y ☐ N☒					
• Other	Y ☐ N☒					
ERGONOMICS Can anyone be injured due to:						
• Poorly designed workstation?	Y ☐ N☒					
• Repetitive body movement?	Y ☐ N☒					
• Constrained body posture or the need for excessive effort?	Y ☐ N☒					
• Design deficiency causing psychological stress?	Y ☐ N☒					
• Inadequate or poorly placed lighting?	Y ☐ N☒					
• Does the plant impact on the surrounding workplace and create potential hazards? (Consider safe access and egress from plant, workflow and design of the workplace)	Y ☐ N☒					

Plant and Equipment Risk Management Form

• Is the location of the plant inappropriate? (Consider potential affects due to environmental conditions and terrain)	Y ☐ N☒					
• Other	Y ☐ N☒					
RADIATION Can anyone using the plant, or in the vicinity of the Plant suffer injury or illness due to exposure to radiation in the form of any of the following: • infra-red radiation • ultra violet light • microwaves	Y ☐ N☒					
NOISE Can anyone using the plant, or in the vicinity of the plant, suffer injury due to exposure to noise?	Y ☒ N☐	Moderate	Unlikely	Moderate	• Operation of the equipment inside the control room may cause hearing damage if exposed to noise that exceeds the exposure standard for noise. The exposure standard for noise is defined in the QLD WHS Regulation as 85 dB(A) continuous for periods over 8 h, or as peak instantaneous levels of 140 dB(C).	• Appropriate hearing protection should be worn whilst operating the equipment, especially in the control room. • Check relevant regulations when moving between states.
VIBRATION Can anyone be injured or suffer ill-health from exposure to vibration?	Y ☐ N☒					
FRICTION Can anyone be burnt due to contact with moving parts, materials or surfaces of the plant?	Y ☐ N☒					
SUFFOCATION Can anyone be suffocated due to lack of oxygen, or atmospheric contamination?	Y ☒ N☐	Major	Unlikely	Extreme	• Suffocation due to lack of oxygen or excess propane or methane in concentration vessel (CV) during maintenance activities.	• Pre and post purge timers built into the BCU of the BV300. Risk assessment required when working

Plant and Equipment Risk Management Form

						inside the CV. Confined space permit required if site requirements call for it. ● Ensure sufficient ventilation. Gas detector in the control room, ● BT personnel on the BV300 must wear a personal gas detection unit. A bump test of personal gas detectors performed before every use. Full calibration every 6 months in accordance with manufacturer's instructions using appropriate test gas.
CONDITION Is a hazard likely due to the age and condition of the plant? (*Consider how hard the machine has been worked, and whether it is used constantly or rarely).*	Y ☒ N☐	Major	Possible	High	● Corrosion of BV300 components such as the CV causes a risk of failure and leaks.	● Visual and measurement (thickness) integrity testing of components such as the CV, combustion chamber and vertical baffle performed as part of preventative maintenance.
● Can anyone be injured as a result of the plant not serviced appropriately and/or maintained in line with manufacturer's recommendations?	Y ☐ N☒					
SLIPS/TRIPS Can anyone using the plant, or in the vicinity of the plant, slip, trip or fall due to:					● Risk of slip, trip or fall from the BV300 stairs whilst accessing or exiting the unit. ● Risk of slip, trip or fall whilst climbing up to the CV roof as well as being on top of the CV roof. ● BV300 bund is a risk of slips, trips or falls. Risk of falls until the handrails are installed.	● Make sure operator wears slip resistant footwear to reduce risk of slips/falls. ● Make sure operator maintains three points of contact when accessing or exiting the BV300 and walking up stairs. ● Ensure handrails are in place on the roof of the CV. Use harness and working at heights permit if handrails are not in place. ● Be aware of wet surfaces on and around the machine in general as condensation may occur under certain operating and atmospheric conditions.
● Uneven, slippery or steep work surfaces?	Y ☒ N☐	Major	Possible	Extreme		
● Poor housekeeping, e.g. spillage in the vicinity?	Y ☒ N☐	Major	Possible	Extreme		
● Obstacles being placed in the vicinity of the plant?	Y ☒ N☐	Major	Possible	Extreme		
● Inappropriate or poorly maintained floor or walking surfaces (i.e. lack of a slip-resistant surface, unprotected holes, penetrations or gaps?)	Y ☐ N☒					
FALLS						

Plant and Equipment Risk Management Form

If operating or maintaining plant at height can anyone slip, trip or fall due to:						• Be aware of bund and watch footing when walking around site. • Handrails installed on the CV roof to prevent falls. Install fixed collapsible rail first then install loose rails. Use harness and working at heights permit whilst handrails are not in place.
• Use of work platforms, stairs or ladders?	Y ☒ N☐					
• Lack of guardrails or other suitable edge protection?	Y ☒ N☐					
• Other	Y ☐ N☒					
FIRE AND EXPLOSIONS Can anyone be injured by fire?	Y ☒ N☐	Major	Rare	High	• Potential leakage of propane or methane gas, as well as the potential for diesel spills, resulting in fire and potential explosion.	• BV unit built to AS3814: Industrial and Commercial Gas Fired Appliances; • Gas detector to be worn by BV Technicians when working around the BV unit; • Leak Detection Unit on main gas train; • Pipelines made in accordance with relevant certificates (Carbon steel) and have a max operating pressure (1,500 kPa) greater than max operating pressure. • Ensure refuelling of diesel is in a well ventilated area. • Ensure fuel and refuelling equipment is stored appropriately (bunded storage away from sources of ignition).
• Can anyone be injured by explosion of gases, vapours, liquids, dusts, or other substances?	Y ☒ N☐	Catastrophic	Rare	High		
TEMPERATURE/MOISTURE Can anyone come into contact with objects at high or low temperatures?	Y ☒ N☐	Major	Possible	High	• Operators on site can suffer burns from high temperatures on the CV, CV roof, as well as the stacks.	• Hot Surface warning signage on the CV and stacks to warn operators of the hot surface dangers. • Operators to take care when working near hot liquid/steam, wear
• Can anyone suffer ill-health due to exposure to high or low temperatures?	Y ☒ N☐	Major	Possible	High		

• Can anyone be injured or suffer ill-health due to exposure to moisture?	Y ☒ N☐	Major	Possible	High	• Scalding can occur if hot purge solution comes into contact with operator skin. • Exposure to hot steam could cause skin injuries.	suitable gloves, long sleeve high vis shirts and eye protection.
STACK EMMISSIONS • Can anyone be injured or suffer ill-health from the stack emissions regarding the below points					• If people on the BV unit site are exposed to concentrated stack emissions due to the emissions concentrating in an enclosed space caused by wind conditions, CO levels can build up in the enclosed space and be potentially dangerous. • There will be a visual impact of the stack plume on neighbours / sensitive receptors in the immediate vicinity of the BV unit. People may react negatively if they are not aware of the project, emissions testing requirements and limits, and measures put in place to ensure the BV operation is safe. • Odour can be an issue if people are working in the direct vicinity of the BV unit and the stack emissions plume is directed close to ground level where they are working.	• Stack emission testing is conducted according to the site EA or EPA licence requirements and the specified emission limits that need to be met will protect the receiving environment. • The BV unit is always set up in an open and naturally ventilated space on site. • The control room doors can be fully open when occupied to ensure sufficient ventilation in the room, or closed to prevent ingress of stack emissions. • Location of the BV unit on site in relation to any nearby site offices must be considered to avoid stack emissions potentially reaching these locations. • The nature of landfill layouts is such that residential housing is never located close enough for stack emissions to be a direct health risk. • Neighbours / sensitive receptors (if applicable) need to be informed of the project and expected stack emissions prior to the project commencing. By providing information about the process and licencing conditions they are aware that the BV unit
• Toxic gases or vapours building up in confined spaces – Location & Quality of stack plume	Y ☒ N☐	High	Possible	Medium		
• Visual observation of stack plume.	Y ☐ N☒	Low	High	Low		
• Odour from stack plume causes irritation and distress to nearby workers.	Y ☒ N☐	Medium	Possible	Low		
•						

Plant and Equipment Risk Management Form

						poses no risk to their health or the environment. ● If workers are expected to be working in the immediate vicinity of the BV unit, the unit can be switched off temporarily while the work is being conducted.
OTHER Can anyone be injured or suffer ill-health from exposure to:					● Exposure to propane and methane gas trapped in the CV. ● Exhaust fumes can be toxic if allowed to accumulate in an enclosed space. ● Exposure to anti-foam through eye contact and ingestion. ● Exposure to quicklime which is harmful by causing skin irritation, serious eye damage and may cause respiratory irritation.	● Sufficient pre and post purge times with BCU control. ● Avoid confined space entry wherever possible. If necessary, ensure risk assessment and permit actioned and sufficient ventilation, use personal gas detector. ● Make sure the fumes do not collect in an enclosed space, open all ventilation available through doors and inspection ports. Refuel only in a well-ventilated area. ● Store chemicals appropriately in bunds and according to their SDS. Use chemicals according to their SDS and recommended PPE such as respiratory, eye and skin protection. ● For quicklime specifically: Avoid breathing dust / fume / gas / mist / vapours / spray. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves / protective clothing / eye protection / face protection.
● Chemicals?	Y ☒ N☐					
● Toxic gases or vapours?	Y ☒ N☐	Major	Unlikely	Low		
● Fumes/Dusts?	Y ☒ N☐	Major	Rare	High		
● Other? (please specify)	Y ☐ N☒					

Plant and Equipment Risk Management Form

1. Hazard Management Details – General		
Plant/Equipment Item: BeneVap	**Make/Model No.: BV150**	**Serial No.: BV150-A01**
Name of Person(s) Conducting Inspection: Rory van Niekerk		**Date Conducted:** 4/09/2018
		**Summary of Key Risks:** • Leaks and Spills • Access to BV150 - Security • Entanglement • Impact and Cutting Injuries • Ergonomics • Noise • Slips, Trips and Falls • Fire and Explosion • Electrocution • Other (Fumes)

Risk Assessment Signoff		
Authorised By:	Signature:	Date:

Plant and Equipment Risk Management Form

2. Documentation		
Relevant Legislation/Standards	**Y / N**	**Comments**
Is plant required to be registered?	Y ☒ N☐	The BV150 trailer (if applicable) must be registered for road use. The BV150 must have a Type B Gas Certification when the burner is fuelled by Natural Gas or Biogas (incl. LFG). LPG gas bottles must have a Certificate of Compliance. The gas works supplying the BV150 must have a gas works certificate.
Is a user license required?	Y ☒ N☐	No statutory license is required to operate the BV150, however, training and certification (BV Training Program) is required to operate the BV150 as a BV Technician (run and managed by BeneTerra with a certification / verification of competency requirement to perform works on the BV150). A truck driver's licence is required to transport the BV150 unit on a trailer.
Key reference material:		
Plant Documentation	**Y / N**	**Comments**
Are operator's manuals accessible?	Y ☒ N☐	A copy of the BV150 operation manual/quick start guide is made available during commissioning.
Is this a restricted use item?	Y ☐ N☒	
Does this item require safe use documents/test?	Y ☒ N☐	BV150 Project Risk Assessment; BV150 SOP; BV150 Inspection Checklist; FRM-044 Project Checklist, BV150 Testing and Commissioning Form; BV150 Maintenance checklist; Genset pre-start form; BV150 Operational Change Management Form.

Plant and Equipment Risk Management Form

3. Hazard Identification						
Hazards Inspected		**Risk Assessment**			**Description of Risk**	**Control Measures**
		Conseq	Likeh'd	Risk Level		
LEAKS AND SPILLS	Y ☒ N☐	Major	Possible	High	• Leaks and spills of the BV150 treated solution from the Concentration Vessel (CV), Discharge tanks, pumps, valves, pipework, fittings and when being discharged to the discharge tanks.	• Bunded discharge tanks (volume sized to site requirements) covering the CV as well as the discharge tank and feed tanks. • HiHi safety float switches in the CV and discharge tank to reduce overflow risk. • Spill kit on site for minor spills • Inspection of seals prior to connecting hoses; Ensure correct fittings in place; Regular site inspection – BV150 Inspection Checklist and BeneTerra FRM-044 Project Checklist.
ACCESS TO BV150 - SECURITY	Y ☒ N☐	Major	Possible	High	• Unauthorised access.	• Where site conditions require, the BV150 area is fenced for the duration of the project with a 6' high fence that has a locked gate.
ENTANGLEMENT Can anyone's hair, clothing, gloves, cleaning brushes, tools, rags or other materials become entangled with moving parts of the plant or materials?	Y ☒ N☐	Major	Unlikely	Low	• Loose clothing, long hair, gloves and other material may become entangled in moving parts of the BV150 such as the blower motor drive shaft, although this is unlikely.	• Make sure clothing, gloves, hair or other such items are kept clear of moving parts of the BV150 when operating. • Guards installed to isolate moving parts where practical • When performing maintenance BV150 power is to be isolated (lock-out and tag-out).
Impact and Cutting Injuries Can anyone be crushed/cut/struck etc. due to:						

Plant and Equipment Risk Management Form

• Material falling off the plant?	Y ☒ N☐	Major	Possible	Extreme	• During setting up of the site, objects such as handrails may be dropped from the top of the BV150 roof. • BV150 may tip over during an extreme storm / hurricane on an uneven surface. • During testing, commissioning, inspection, operation, maintenance, cleaning or repair, impact and cutting injuries are possible due to the many varied components that form the BV150.	• All unnecessary people have been removed from BV150 area. Where site conditions require, BV150 area is fenced for the duration of the project with a 6' high fence that has a locked gate. • Ensure the site surface is level. No staff on site during an extreme storm / hurricane, remote operation. • Make sure BV Technician does not perform any cleaning, maintenance or repair until the BV150 is turned off and isolated (by lock-out and tag-out) and any moving parts have come to a complete stop. Isolating power will prevent remote start-up during these activities.
• Uncontrolled/unexpected movement of plant/load?	Y ☐ N☒					
• Lack of capacity to slow, stop or immobilize plant?	Y ☐ N☒					
• The plant tipping or rolling over?	Y ☒ N☐	Major	Possible	High		
• Parts of the plant disintegrating or collapsing?	Y ☐ N☒					
• Contact with moving parts during testing, commissioning, inspection, operation, maintenance, cleaning or repair?	Y ☒ N☐	Major	Unlikely	High		
• Being thrown off or under the plant?	Y ☐ N☒					
• Contact with sharp or flying objects? (e.g. work pieces being ejected)	Y ☐ N☒					
• The mobility of the plant?	Y ☐ N☒					
• Inappropriate parts and accessories being used?	Y ☐ N☒					
• Other	Y ☐ N☐					
SHEARING Can anyone's body parts be sheared between two parts of plant, or between a part of the plant and a work piece or structure?	Y☒ N☐	Major	Possible	Extreme	• Getting sheared between the BV150 trailer and the prime mover when mobilising and demobilising.	• All unnecessary people have been removed from BV150 area. • Only licenced operators to drive the prime mover. • Spotter (if required) to stand clear of the prime mover and BV150 trailer. • Positive comms between the driver of the prime mover and the spotter (if required).

Plant and Equipment Risk Management Form

PRESSURISED CONTENT Can anyone come into contact with fluids or gases under high pressure, due to plant failure or misuse of the plant?	Y ☒ N☐	Major	Unlikely	Extreme	• Failure of air compressor and related pipework and fittings (1,000 kPa max operating pressure). • Failure of methane and propane gas train pipework and components (expected maximum supply pressure of 1,000 kPa, varies by site). • Failure of 9 kg LPG gas bottles (1 off), (120 kPa operating pressure).	• Perform preventative maintenance on air compressor and all gas trains. Pressure gauge installed in the pipework, check for corrosion signs; PPE used while operating machinery. Pipelines made in accordance with relevant certificates (stainless steel and nylon pressure hose) and have a recommended operating pressure (3.6 MPa and >7,000 kPa respectively) greater than max operating pressure of air compressor (1,000 kPa). • BV150 built to AS3814: Industrial and Commercial Gas Fired Appliances - Gas trains include isolation, filter, flow meter, pressure control valves, gauges, low and high pressure switches, double block safety valves and a limiting orifice valve. Pipe pressure ratings as per above. Perform inspections as per BV150 checklist during site visits. • BV150 built to AS3814: Industrial and Commercial Gas Fired Appliances; LPG gas bottles, pipework and fittings visually inspected for integrity when received and during operational checks; all ignition sources acceptable distance from vessel site, bottle covered by enclosure.
ELECTRICITY Can anyone be injured or burnt due to:					• BV Technicians may gain access to electrical panels for a general visual inspection of the panel internals and integrity when mobilising and performing other preventative maintenance works.	• Perform visual checks only when the main power supply to BV150 has been isolated (using lock-out and tag-out). This will also remove remote control whilst panels are inspected.
• Live electrical conductors? (*e.g.* exposed wires)	Y ☐ N☒					
• Working in close proximity to electrical conductors?	Y ☐ N☒					
• Access to electricity?	Y ☒ N☐	Major	Unlikely	Extreme		

Plant and Equipment Risk Management Form

• Damaged or poorly maintained electrical leads, cables or switches?	Y ☒ N☐	Major	Unlikely	Extreme	• Electrocution from damaged submersible pump electrical cord in the discharge tank solution.	• All electrical cord items to be tested and tagged every six months. Inspect the submersible and feed pump electrical cords with the BV150 checklist items. • Electrical panels certified to AS3000 AS/NZS Wiring Rules.
• Water near electrical equipment?	Y ☒ N☐	Major	Unlikely	Extreme		
• Lack of isolation procedures?	Y ☐ N☒					
• Other	Y ☐ N☒					
ERGONOMICS Can anyone be injured due to:						
• Poorly designed workstation?	Y ☐ N☒					
• Repetitive body movement?	Y ☐ N☒					
• Constrained body posture or the need for excessive effort?	Y ☐ N☒					
• Design deficiency causing psychological stress?	Y ☐ N☒					
• Inadequate or poorly placed lighting?	Y ☐ N☒					
• Does the plant impact on the surrounding workplace and create potential hazards? (Consider safe access and egress from plant, workflow and design of the workplace)	Y ☐ N☒					
• Is the location of the plant inappropriate? (Consider potential affects due to environmental conditions and terrain)	Y ☐ N☒					
• Other	Y ☐ N☒					

Plant and Equipment Risk Management Form

RADIATION Can anyone using the plant, or in the vicinity of the Plant suffer injury or illness due to exposure to radiation in the form of any of the following: • infra-red radiation • ultra violet light • microwaves	Y ☐ N☒					
NOISE Can anyone using the plant, or in the vicinity of the plant, suffer injury due to exposure to noise?	Y ☒ N☐	Moderate	Unlikely	Moderate	• Operation of the equipment may cause hearing damage if exposed to noise that exceeds the exposure standard for noise. The exposure standard for noise is defined in the QLD WHS Regulation as 85 dB(A) continuous for periods over 8 h, or as peak instantaneous levels of 140 dB(C).	• Appropriate hearing protection should be worn whilst operating the equipment. • Check relevant regulations when moving between states.
VIBRATION Can anyone be injured or suffer ill-health from exposure to vibration?	Y ☐ N☒					
FRICTION Can anyone be burnt due to contact with moving parts, materials or surfaces of the plant?	Y ☐ N☒					
SUFFOCATION Can anyone be suffocated due to lack of oxygen, or atmospheric contamination?	Y ☒ N☐	Major	Unlikely	Extreme	• Suffocation due to lack of oxygen or excess propane or methane in concentration vessel (CV) during maintenance activities.	• Pre and post purge timers built into the BCU of the BV150. Confined space permit required when working inside the CV. Ensure sufficient ventilation. BT Technician on the BV150 must wear a personal gas detection unit. A bump test of personal gas detectors performed before every use. Calibration in accordance with manufacturer's instructions using appropriate test gas.

Plant and Equipment Risk Management Form

CONDITION Is a hazard likely due to the age and condition of the plant? (*Consider how hard the machine has been worked, and whether it is used constantly or rarely).*	Y ☐ N☒				• BV150 is a new unit and risk of failure and leaks in components such as the CV are unlikely.	• Visual and measurement (thickness) integrity testing of components such as the CV, burner tube and vertical baffle performed as part of preventative maintenance.
• Can anyone be injured as a result of the plant not serviced appropriately and/or maintained in line with manufacturer's recommendations?	Y ☐ N☒					
SLIPS/TRIPS Can anyone using the plant, or in the vicinity of the plant, slip, trip or fall due to:					• Risk of slip, trip or fall from the BV150 ladder whilst accessing or exiting the unit. Risk of slip, trip or fall whilst climbing up to the CV roof as well as being on top of the CV roof. BV150 discharge tank bund is a risk of slips, trips or falls. Risk of falls from CV access platform until the handrails are installed.	• Make sure BV Technician wears slip resistant footwear to reduce risk of slips/falls. Make sure BV Technician maintains three points of contact when accessing or exiting the BV150 and using ladders. • Ensure hand rails are in place on the platform of the CV for stack chevron access. Use harness and lanyard with working at heights permit when walking from access platform onto roof. Avoid unnecessary access to roof. • Limit access by signage/chains to top of CV roof whilst BV150 is in operation as surfaces may be wet. Be aware of wet surfaces on and around the machine in general as condensation may occur under certain operating and atmospheric conditions.
• Uneven, slippery or steep work surfaces?	Y ☒ N☐	Major	Possible	Extreme		
• Poor housekeeping, e.g. spillage in the vicinity?	Y ☒ N☐	Major	Possible	Extreme		
• Obstacles being placed in the vicinity of the plant?	Y ☒ N☐	Major	Possible	Extreme		
• Inappropriate or poorly maintained floor or walking surfaces (i.e. lack of a slip-resistant surface, unprotected holes, penetrations or gaps?)	Y ☐ N☒					
FALLS If operating or maintaining plant at height can anyone slip, trip or fall due to:						
• Use of work platforms, stairs or ladders?	Y ☒ N☐	Major	Possible	Extreme		
• Lack of guardrails or other suitable edge protection?	Y ☒ N☐	Major	Possible	Extreme		

Plant and Equipment Risk Management Form

• Other	Y ☐ N☒					• Be aware of discharge tank bund and watch footing when walking around site. • Handrails installed on the CV platform to prevent falls. Install collapsible rails prior to accessing CV platform via ladder. Use harness when accessing roof.
FIRE AND EXPLOSIONS Can anyone be injured by fire?	Y ☒ N☐	Major	Rare	High	• Potential leakage of propane or methane gas, resulting in fire and potential explosion.	• BV150 built to AS3814: Industrial and Commercial Gas Fired Appliances; personal gas detector worn by BV Technicians when on BV150; Pipelines made in accordance with relevant certificates (stainless steel) and have a max operating pressure (>3.6 MPa) greater than BV150 operating pressure (approx 55 kPa).
• Can anyone be injured by explosion of gases, vapours, liquids, dusts, or other substances?	Y ☒ N☐	Catastrophic	Rare	High		
TEMPERATURE/MOISTURE Can anyone come into contact with objects at high or low temperatures?	Y ☒ N☐	Major	Possible	High	• BV Technicians on site can suffer burns from high temperatures on the CV, CV roof, as well as the stacks. • Scalding can occur if hot purge solution comes into contact with BV Technician skin. • Exposure to hot steam could cause skin injuries.	• Signage/chains preventing BV Technicians on site from entering the CV roof area during operation. • Exclusion zones clearly defined preventing non-BV Technicians on site from getting closer than 5 m to the discharge tank. Client to set up exclusion zone.
• Can anyone suffer ill-health due to exposure to high or low temperatures?	Y ☒ N☐	Major	Possible	High		
• Can anyone be injured or suffer ill-health due to exposure to moisture?	Y ☒ N☐	Major	Possible	High		
OTHER Can anyone be injured or suffer ill-health from exposure to:					• Exposure to propane and potentially methane gas trapped in the CV. • Exhaust fumes can be toxic if allowed to accumulate in an enclosed space.	• Sufficient pre and post purge times with BCU control. Avoid confined space entry wherever possible. If necessary ensure permit actioned and sufficient ventilation.
• Chemicals?	Y ☒ N☐	Major	Possible	Medium		
• Toxic gases or vapours?	Y ☒ N☐	Major	Unlikely	Low		

Plant and Equipment Risk Management Form

• Fumes/Dusts?	Y ☒ N☐	Major	Rare	High	• Exposure to anti-foam through eye contact and ingestion. • Exposure to quicklime which is harmful by causing skin irritation, serious eye damage and may cause respiratory irritation.	• Make sure the fumes do not collect in an enclosed space, unit is well ventilated with minimal enclosure. • Store chemicals appropriately in bunds and according to their SDS. Use chemicals according to their SDS and recommended PPE such as respiratory, eye and skin protection. • For quicklime specifically: Avoid breathing dust / fume / gas / mist / vapours / spray. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves / protective clothing / eye protection / face protection.
• Other? (please specify)	Y ☐ N☒					

APPENDIX B

CONTROL LOGIC PLANS

PROCESS CONTROL LIST/KEY

1. LEVEL CONTROLS/SWITCHES

LC1 (PT-101) - PRESSURE TRANSMITTER. CONTROLS CV LEVEL THROUGH INFLUENT PUMP. PLC ALARMS CRITICAL ON SAFETY Hi (SH) AND SAFETY Lo (SL), AS WELL AS BCU RUN INTERLOCK.

LC2 (PT-122) - SECOND PRESSURE TRANSMITTER SENSING CV LEVEL. PLC ALARMS CRITICAL FOR LEVEL VARIATION SET POINT BETWEEN LC1 & LC2

2. TEMPERATURE CONTROLS

TE1 (TE-723) - TEMPERATURE THERMOCOUPLE. MEASURES CV TEMPERATURE OF CONCENTRATE. PLC ALARMS AS CRITICAL IF CV TEMP IS Hi (SH) ON PLC AND RELAY MODULE ALARM, AS WELL AS BCU RUN INTERLOCK.

TE2 (TE-721) - TEMPERATURE THERMOCOUPLE. MEASURES STACK TEMPERATURE. PLC ALARMS AS WARNING IF STACK TEMP IS Hi (SH).

TE3 (TE-722) - TEMPERATURE THERMOCOUPLE. MEASURES CC UPPER TEMPERATURE. PLC ALARMS CRITICAL IF CC TEMP IS Hi (SH). PLC USES READING IN "AUTO AFER" MODE "USING CC TEMP" TO RAMP CAF UP OR DOWN TO MAINTAIN CC TEMP SET POINT FOR SET FUEL FLOW RATE.

TE4 (TE-130) - TEMPERATURE THERMOCOUPLE. MEASURES AMBIENT AIR TEMPERATURE.

3. FLOW SENSORS

FT1 (FS-130) - MECHANICAL FLOW SWITCH. PLC ALARMS WARNING IF FLOW NOT SENSED DURING RUN OR IF FLOW SENSED PRIOR TO "START" BEING PRESSED, AS WELL AS BCU RUN INTERLOCK.

FT2 (FT-710) - ORIFICE PLATE FLOW METER FOR MAIN GAS. USED BY PLC FOR AUTOMATION.

FT3 (FE-711) - ULTRASONIC FLOW METER FOR INFLUENT SUPPLY, MANUAL LOCAL DISPLAY. PLC ALARMS CRITICAL IF INFLUENT PUMP FLOW DOES NOT REGISTER FOR SET TIME PERIOD.

4. VALVES

FV1 (PCV-702) - MODULATING BUTTERFLY VALVE. PLC CONTROLLED TO ENSURE SUFFICIENT COMBUSTION AIR AND TO PROTECT CA FAN FROM MOISTURE WHEN NOT RUNNING.

FV2 (FCV-100) - ISOLATION VALVE. MANUAL MAIN GAS ISOLATION VALVE.

PSV1 (PSV-100) - PRESSURE RELIEF VALVE. SPRING ACTIVATED, RELIEVES MAIN GAS SUPPLY TO ATMOSPHERE ABOVE A SET POINT PRESSURE (50 kPa) TO PROTECT LDU.

FV3 (XCV-713) - MAIN GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES MAIN GAS SUPPLY.

FV4 (XCV-714) - MAIN GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES MAIN GAS SUPPLY.

LDU (LDU-100) - MAIN GAS BLOCK VALVE LEAK DETECTION. CHECKS THE MAIN BLOCK VALVES ARE NOT LEAKING BEFORE THE RUN COMAND IS SENT TO THE BCU ON START UP AND WHEN THE BLOCK VALVES CLOSE AFTER SHUTDOWN. BCU INTERLOCK

ZSC (ZSC-100) - MAIN GAS BLOCK VALVE PROOF OF CLOSURE SWITCH. PLC ALARMS AS CRITICAL IF FV4 IS OPEN PRIOR TO BV STARTING, AS WELL AS BCU INTERLOCKED.

FV5 (FO-100) - MAIN GAS LIMITING ORIFICE VALVE. MECHANICAL SET HI FIRING LIMIT FOR GAS TRAIN.

FV6 (TCV-712) - FUEL MODULATING VALVE. FAIL SAFE SPRING RETURN. PLC CONTROLLED TO RUN FUEL TO SET POINT.

FV7 (FCV-112) - ISOLATION VALVE. MANUAL PILOT GAS ISOLATION VALVE.

PCV2 (PCV-110) - PILOT GAS PRIMARY PRESSURE CONTROL VALVE. SETS THE PILOT TRAIN MAXIMUM PRESSURE.

PSV2 (PSV-110) - PRESSURE RELIEF VALVE. SPRING ACTIVATED, RELIEVES PILOT GAS SUPPLY TO ATMOSPHERE ABOVE A SET POINT PRESSURE AND PROTECTS SECONDARY PCV.

PCV3 (PCV-111) - PILOT GAS SECONDARY PRESSURE CONTROL VALVE. SETS THE PILOT TRAIN PRESSURE UPSTREAM OF THE MAIN BLOCK VALVES.

PSV3 (PSV-111) - PRESSURE RELIEF VALVE. SPRING ACTIVATED, RELIEVES PILOT GAS SUPPLY TO ATMOSPHERE ABOVE A SET POINT PRESSURE AND PROTECTS DOWNSTREAM EQUIPMENT.

FV8 (FCV-110) - PILOT GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES PILOT GAS SUPPLY.

FV9 (FCV-111) - PILOT GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES PILOT GAS SUPPLY.

FV11 (FCV-140) - MODULATING ELECTRIC PNUMATIC, FAIL SAFE. INLFLUENT VALVE, OPENS WHEN INFLUENT PUMP RUNS. FAIL SAFE/CLOSED WHEN POWER IS LOST TO PROTECT CV FROM OVERFLOW.

FV12 (FCV-141) - INFLUENT SAMPLE MANUAL BALL VALVE.

FV13 (XCV-718) - ELECTRIC BUTTERFLY VALVE. USED TO MODULATE INFLUENT FLOW. CLOSED WHEN PUMP IS OFF AND FOR 10 SECONDS WHEN PUMP IS TURNED ON TO ALLOW FULL PUMP PRESSURE TO THE LEVEL PT FLUSHING SOLENOIDS, AFTER WHICH THE VALVE IS OPENED TO ITS RUN SP.

FV14 (FCV-123) CONCENTRATE SAMPLE VALVE.

FV15 (XCV-719) - ELECTRIC BUTTERFLY VALVE. OPENS TO ALLOW CV DISCHARGE TO TAKE PLACE, AUDIBLE ALARM ON DISCHARGE. PLC ALARMS CRITICAL IF MAJOR DISCHARGE DOES NOT COMPLETE WITHIN SET POINT DISCHARGE CYCLE TIME.

FV16 (FCV-106) - MANUAL BALL VALVE. CC FLUE GAS SAMPLING VALVE.

FV17 (FCV-103) - ELECTRIC ACTUATED BALL VALVE, FAIL SAFE. PROTECTS O2 SENSOR FROM GETTING WET ON START-UP. OPENS ON BCU RUN COMAND AND CLOSES WHEN BCU RUN COMMAND IS LOST.

FV18 (FCV-101) - 24VDC SOLENOID VALVE USED TO FLUSH CV LEVEL PT (LC1) WITH INFLUENT TO KEEP PT CLEAN. OPENS FOR 10 SECONDS EVERY TIME THE INFLUENT PUMP TURNS ON.

FV19 (FCV-122) - 24VDC SOLENOID VALVE USED TO FLUSH CV LEVEL PT (LC2) WITH INFLUENT TO KEEP PT CLEAN. OPENS FOR 10 SECONDS EVERY TIME THE INFLUENT PUMP TURNS ON.

FV20 (FCV-102) - 24VDC SOLENOID VALVE USED TO DRAIN MAIN GAS VERTICAL PIPE AND REMOVE MOISTURE TO ENSURE FT2 WORKS. OPENS ON SET POINT FREQUENCY FOR SET TIME.

FV21 (NRV-140) - 316SS FLAP CHECK VALVE FOR INFLUENT TRAIN TO PREVENT BACKFLOW.

FV22 (FV-140) - 316SS MANUAL ISOLATION BALL VALVE FOR THE INFLUENT TRAIN.

5. PUMPS & CA FAN

CAF (B-130) - CENTRIFUGAL FAN. GENERATES FLOW AND PRESSURE OF COMBUSTION AIR. PLC AND VFD CONTROLLED.

VFD (VFD-703) - VARIABLE FREQUENCY DRIVE FOR CAF.

P1 (P-140) - INFLUENT SUPPLY PUMP. PUMPS INFLUENT FROM THE SUPPLY TANK INTO THE CV.

P2 (P-170) - ANTI-FOAM PUMP. PUMPS ANTI FOAM INTO THE CV IF HEADSPACE PRESSURE EXCEEDS SET POINT FOR A PRESET TIME PERIOD.

6. OTHER

GM1 (GM-100) - 50 MICRON FILTER FOR MAIN GAS. KEEPS MAIN GAS TRAIN PROTECTED FROM LARGE PARTICULATES.

PS1 (PSL-100) - PRESSURE SWITCH Lo FOR MAIN GAS. PLC ALARMS WHEN MAIN GAS PRESSURE IS LOW, AS WELL AS BCU RUN INTERLOCK.

PS2 (PSH-100) - PRESSURE SWITCH Hi FOR MAIN GAS. PLC ALARMS WHEN MAIN GAS PRESSURE IS HIGH, AS WELL AS BCU PRE INTERLOCK.

PS3 (PSL-100) - PRESSURE SWITCH Lo FOR PILOT GAS. PLC ALARMS WHEN PILOT GAS PRESSURE IS LOW, AS WELL AS BCU PRE INTERLOCK.

PS4 (PSH-100) - PRESSURE SWITCH Hi FOR PILOT GAS. PLC ALARMS WHEN PILOT GAS PRESSURE IS HIGH, AS WELL AS BCU RUN INTERLOCK.

GM2 (GM-110) - 50 MICRON FILTER FOR PILOT GAS. KEEPS PILOT GAS TRAIN PROTECTED FROM LARGE PARTICULATES.

PT1 (PT-725) - PRESSURE TRANSMITTER. MEASURES CV HEADSPACE PRESSURE. PLC ACTIVATES ANTI-FOAM PUMP IF PRESSURE EXCEEDS SET POINT AND RUNS FOR A PRESET TIME PERIOD. PLC ALARMS AS CRITICAL IF CV HEADSPACE PRESSURE EXCEEDS HiHi (SH) SET POINT ON PLC.

AC1 (AC-150) - AIR COMPRESSOR SUPPLY FOR FV11 (INFLUENT VALVE) WITH PNEUMATIC ACTUATOR.

YT (YT-100) - UV SENSOR. SENSES THE FLAME AND PROVIDES A VOLTAGE SIGNAL INDICATING FLAME STRENGTH. BCU INTERLOCKED.

BL (BL-100) - IGNITOR/SPARKER TRANSFORMER. PROVIDES THE VOLTAGE REQUIRED FOR THE SPARK PLUG TO PROVIDE A SPARK DURING IGNITION.

QT (QT-100) - O2 LAMBDA SENSOR. SENSES AFER (EXCESS AIR) AND TRANSMITS TO PLC. PLC USES AFER READING IN "AUTO AFER" MODE "USING O2 SENISOR" TO RAMP CAF UP OR DOWN TO MAINTAIN AFER SET POINT FOR SET FUEL FLOW RATE. PLC ALARMS IN WARNING IF AFER Lo SET POINT IS REACHED.

SO (SO-100) - FLAME ARRESTOR TO PROTECT GAS SUPPLY LINE UPSTREAM OF BURNER HEAD SHOULD A FLASHBACK OCCUR FROM THE BURNER HEAD. LOCATED IMMEDTIALEY UPSTREAM OF THE BURNER HEAD ON THE BV UNIT.

LEGEND FOR LABELS:

AC - AIR COMPRESSOR
BCU - BURNER CONTROL UNIT
BL - IGNITOR/SPARKER TRANSFORMER
CA - COMBUSTION AIR
CAF - COMBUSTION AIR FAN
CC - COMBUSTION CHAMBER
CKV - CV OVERFLOW VALVE
CV - CONCENTRATION VESSEL
FT - FLOW TRANSMITTER
FV - FLOW VALVE
GM - FILTER/Y-STRAINER
LC - LEVEL CONTROL
LDU - LEAK DETECTION UNIT
P - PUMP
PCV - PRESSURE CONTROL VALVE
PLC - PROGRAMMABLE LOGIC CONTROLLER
PS - PRESSURE SWITCH
PSV - PRESSURE SAFETY VALVE
PT - PRESSURE TRANSMITTER
PZ - PNEUMATIC ACTUATOR
QT - O2/LAMBDA SENSOR
SH - SAFETY Hi
SL - SAFETY Lo
TE - TEMPERATURE SENSOR
VFD - VARIABLE FREQUENCY DRIVE
YT - UV SENSOR
ZSC - PROOF OF CLOSURE SWITCH

CRITICAL SAFETY CONTROL INSTRUMENT

BCU INTERLOCKS

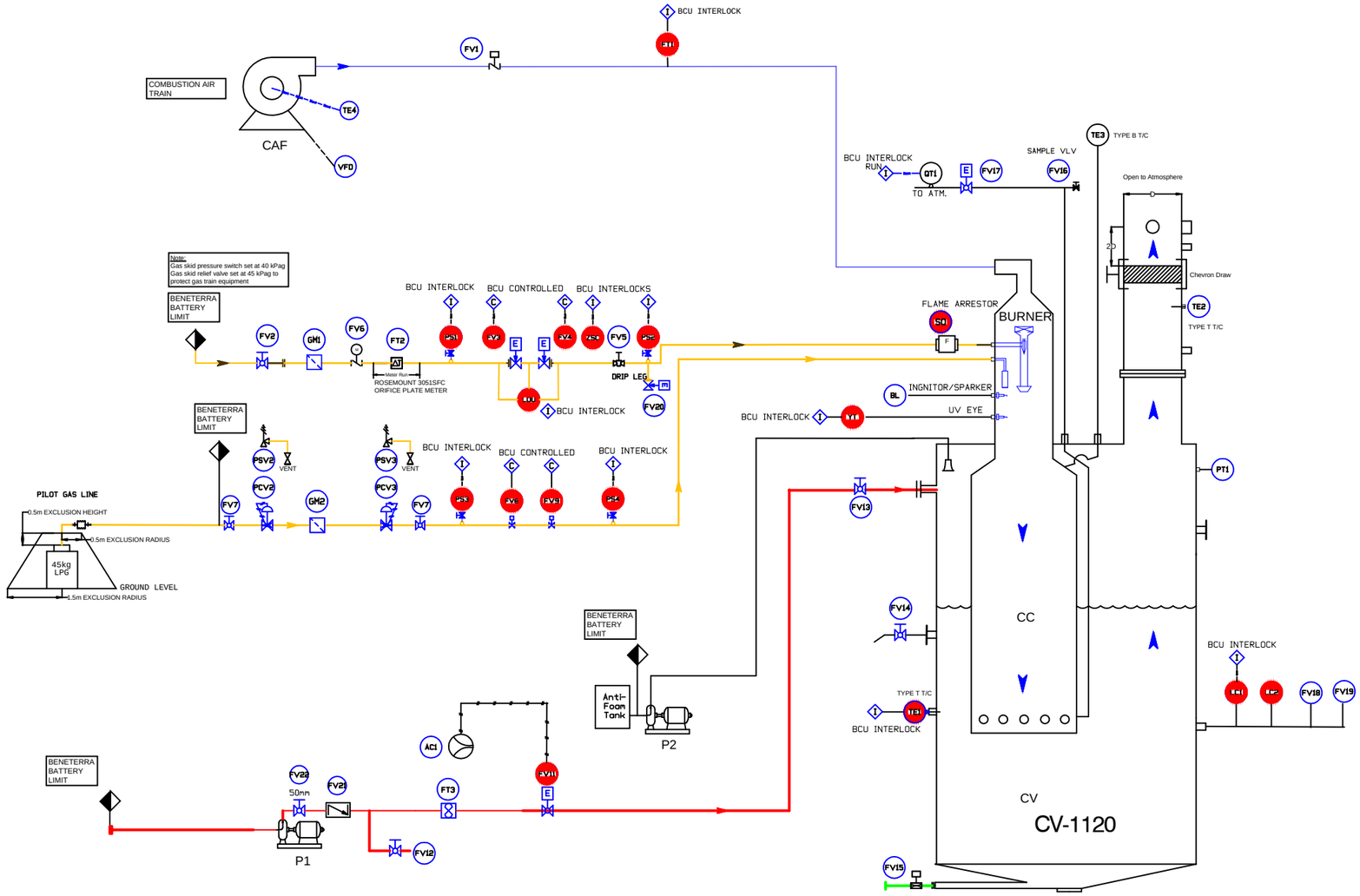
PRE INTERLOCKS (BEFORE START IS PRESSED)
BCU:
-FT1 (FS 130)
-PG FV8 & 9 (FCV110 FCV111)
-UV YT (YT 100)
-MG PS2 (PSH 100)
-MG ZSC (ZSC 100)
-PG PS3 (PSL 100)
PLC:
-LDU (LDU 100)

RUN INTERLOCKS (WHEN START IS PRESSED)
BCU:
-MG FV3 & 4 (XCV713 XCV714)
-UV YT 100
-CA FT1 (FS 130)
-MG PS1 (PSL 100)
-PG PS4 (PSH 100)
-CV LC1 (PT 101 HH)- Red Lion
-CV LC1 (PT 101 LL)- Red Lion
-CV TE1 (TE 723 Hi)- Red Lion

BCU CONTROLLED

-FV3 & 4 (XCV-713 & XCV-714)
-FV8 & 9 (FCV-110 & FCV-111)

ESTOP: One on main control panel, one near the power isolator switch and one at the rear of the unit at skid level



Notes:

AS CONSTRUCTED CONTROL LOGIC FOR BV300-U02-RHONDA WITH MODS REQ'D FOR AUS TYPE B CERTIFICATION.

TYPE B AND MAINTENANCE MODS COMPLETED ON:
30 JUNE 2024

RE-COMMISSIONED IN:
JULY 2024

REV:	DESCRIPTION:	BY:	DATE:

STATUS: PRELIM

BENETERRA PTY LTD
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CLIENT: BENETERRA PTY LTD

SITE: BENEVAP - BV300-U02-RHONDA

TITLE: BV300-U02-RHONDA - P&ID CONTROL LOGIC

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-06-21	RVN	SPH

PROJECT NO:	DRAWING NO:	REVISION:
BV300US02	BV300US02CL	0

PROCESS CONTROL LIST/KEY

1. LEVEL CONTROLS/SWITCHES

LC1 (PT-120) - PRESSURE TRANSMITTER. CONTROLS CV LEVEL THROUGH INFLUENT PUMP. PLC ALARMS CRITICAL ON SAFETY Hi (SH) AND SAFETY Lo (SL), AS WELL AS BCU RUN INTERLOCK.

LC2 (LSHH-120) - FLOAT SWITCH, WIRED FAIL SAFE. CV LEVEL Hi-Hi FLOAT SWITCH. PLC CRITICAL HiHi ALARM (SH) IF CV LEVEL ACTIVATES SWITCH, AS WELL AS BCU RUN INTERLOCK.

2. TEMPERATURE CONTROLS

TE1 (TE-120) - TEMPERATURE THERMOCOUPLE. MEASURES CV TEMPERATURE OF CONCENTRATE. PLC ALARMS AS CRITICAL IF CV TEMP IS Hi (SH) ON PLC AND RELAY MODULE ALARM, AS WELL AS BCU RUN INTERLOCK.

TE2 (TE-121) - TEMPERATURE THERMOCOUPLE. MEASURES STACK TEMPERATURE. PLC ALARMS AS WARNING IF STACK TEMP IS Hi (SH).

TE3 (TE-150) - TEMPERATURE THERMOCOUPLE. MEASURES CC BASE TEMPERATURE. PLC ALARMS CRITICAL IF CC TEMP IS Hi (SH).

TE4 (TE-100) - MAIN GAS PT100 TEMPERATURE PROBE. TRIPS BCU ON RUN INTERLOCK IF MAIN GAS TEMP GOES Hi, ALARMS PLC AS CRITICAL.

3. FLOW SENSORS

FT1 (FS-130) - MECHANICAL FLOW SWITCH. PLC ALARMS WARNING IF FLOW NOT SENSED DURING RUN OR IF FLOW SENSED PRIOR TO "START" BEING PRESSED, AS WELL AS BCU PRE & RUN INTERLOCK.

FT2 (FT-100) - THERMAL MASS FLOW METER FOR MAIN GAS. USED BY PLC FOR AUTOMATION AND BCU RUN INTERLOCK IF OUT OF RANGE, PLC ALARMS AS CRITICAL IF MAIN GAS FLOW IS OUT OF RANGE.

FT3 (FE-140) - TURBINE FLOW METER FOR INFLUENT SUPPLY, MANUAL LOCAL DISPLAY. PLC ALARMS CRITICAL IF INFLUENT PUMP FLOW DOES NOT REGISTER FOR SET TIME PERIOD.

4. VALVES

FV1 (FV-130) - OPEN/CLOSE BUTTERFLY VALVE. PLC CONTROLLED TO PROTECT CA FAN FROM MOISTURE WHEN NOT RUNNING.

FV2 (FV-100 & FV-107) - ISOLATION VALVE. MANUAL MAIN GAS ISOLATION VALVE.

PCV1 (PCV-100) - PRESSURE CONTROL VALVE. CONTROLS MAIN GAS PRESSURE DOWNSTREAM TO ACHIEVE SET POINT AT BURNER.

PSV1 (PSV-100) - PRESSURE RELIEF VALVE. SPRING ACTIVATED, RELIEVES MAIN GAS SUPPLY TO ATMOSPHERE ABOVE A SET POINT PRESSURE.

FV3 (FV-101) - MAIN GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES MAIN GAS SUPPLY.

FV4 (FV-102) - MAIN GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES MAIN GAS SUPPLY.

ZSC1 (ZSC-102) - MAIN GAS BLOCK VALVE PROOF OF CLOSURE SWITCH. PLC ALARMS AS CRITICAL IF FV4 IS OPEN PRIOR TO BV STARTING, AS WELL AS BCU INTERLOCKED.

FV5 (FO-100) - MAIN GAS LIMITING ORIFICE VALVE. MECHANICAL SET HI FIRING LIMIT FOR GAS TRAIN.

FV6 (ZZ-100) - FUEL MODULATING VALVE. FAIL SAFE SPRING RETURN. PLC CONTROLLED TO RUN FUEL TO SET POINT.

FV7 (FV-105) - ISOLATION VALVE. MANUAL PILOT GAS ISOLATION VALVE.

PCV2 (PCV-110) - PILOT GAS PRIMARY PRESSURE CONTROL VALVE. SETS THE PILOT TRAIN MAXIMUM PRESSURE.

PSV2 (PSV-110) - PRESSURE RELIEF VALVE. SPRING ACTIVATED, RELIEVES PILOT GAS SUPPLY TO ATMOSPHERE ABOVE A SET POINT PRESSURE AND PROTECTS SECONDARY PCV.

PCV3 (PCV-111) - PILOT GAS SECONDARY PRESSURE CONTROL VALVE. SETS THE PILOT TRAIN PRESSURE UPSTREAM OF THE MAIN BLOCK VALVES.

PSV3 (PSV-111) - PRESSURE RELIEF VALVE. SPRING ACTIVATED, RELIEVES PILOT GAS SUPPLY TO ATMOSPHERE ABOVE A SET POINT PRESSURE AND PROTECTS DOWNSTREAM EQUIPMENT.

FV8 (FV104) - ISOLATION VALVE. MANUAL PILOT TRAIN ISOLATION VALVE.

PCV4 (PCV-110) - PILOT GAS PRIMARY PRESSURE CONTROL VALVE FROM MAIN GAS SUPPLY. SETS THE PILOT TRAIN PRESSURE WHEN THE MAIN GAS IS CONNECTED TO THIS LINE. CURRENTLY NOT IN USE.

FV9 (FV-110) - PILOT GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES PILOT GAS SUPPLY.

FV10 (FV-111) - PILOT GAS BLOCK VALVE. BCU CONTROLLED. OPENS AND CLOSES PILOT GAS SUPPLY.

FV11 (FV-140) - MANUAL ISOLATION BALL VALVE FOR THE INFLUENT TRAIN.

FV12 (FV-142) - ISOLATION SOLENOID VALVE. INLFUENT AUTOMATED SOLENOID VALVE, OPENS WHEN INFLUENT PUMP RUNS. FAIL SAFE/CLOSED WHEN POWER IS LOST WITH 7m STATIC HEAD CRACKING PRESSURE TO PROTECT CV.

FV13 (NRV-140) - NON-RETURN VALVE FOR INFLUENT TRAIN.

FV14 (FV-141) - MANUAL SAMPLING BALL VALVE FOR INFLUENT TRAIN.

FV15 (FV-122) - CV SAMPLE MANUAL BALL VALVE.

FV16 (FV-170) - FLOW ADJUSTING VALVE. MANUAL FINE TUNING OF ANTI-FOAM VOLUME APPLIED PER ANTI-FOAM EVENT.

FV17 (FV-151) - ELECTRIC/PNEUMATIC BUTTERFLY VALVE, SPRING RETURN FAILS CLOSED. OPENS TO ALLOW CV DISCHARGE TO TAKE PLACE, VISUAL AND AUDIBLE ALARM ON DISCHARGE. PLC ALARMS CRITICAL IF MAJOR DISCHARGE DOES NOT COMPLETE WITHIN SET POINT DISCHARGE CYCLE TIME.

FV18 (CKV-120) - SPRING LOADED NON-RETURN VALVE. CV OVERFLOW VALVE IF PT3 (CV Hi/SH) AND LC3 (CV HiHi/SH) FAIL. THIRD LEVEL OF PROTECTION AGAINST CV OVERFLOW.

FV19 (FV-106) - MANUAL BALL VALVE. CC FLUE GAS SAMPLING VALVE.

FV20 (FV-103) - ELECTRIC/PNEUMATIC ACTUATED BALL VALVE, FAIL SAFE. PROTECTS O2 SENSOR FROM GETTING WET ON START-UP.

ZSC2 (ZSC-103) - O2 SENSOR ISOLATION VALVE (FV-103) LIMIT SWITCH. PROVES FV-103 CLOSED DURING PRE-PURGE (BCU PRE-IGNITION INTERLOCK) AND OPEN DURING RUN (BCU RUN INTERLOCK). PLC ALARMS AS CRITICAL IF ZSC2 IS OPEN DURING PRE-PURGE OR CLOSED DURING RUN.

5. PUMPS & CA FAN

CAF (B-130) - CENTRIFUGAL FAN. GENERATES FLOW AND PRESSURE OF COMBUSTION AIR. PLC AND VFD CONTROLLED.

VFD - VARIABLE FREQUENCY DRIVE FOR CAF.

P1 (P-140) - INFLUENT SUPPLY PUMP. SUPPLIES INFLUENT FROM THE SUPPLY TANK.

P2 (P-170) - ANTI-FOAM PUMP. RUNS IF HEADSPACE PRESSURE EXCEEDS SET POINT FOR A PRESET TIME PERIOD.

6. OTHER

GM1 (GM-100) - 50 MICRON FILTER FOR MAIN GAS. KEEPS MAIN GAS TRAIN PROTECTED FROM LARGE PARTICULATES.

PS1 (PSL-100) - PRESSURE SWITCH Lo FOR MAIN GAS. PLC ALARMS WHEN MAIN GAS PRESSURE IS LOW, AS WELL AS BCU RUN INTERLOCK.

PS2 (PSH-100) - PRESSURE SWITCH Hi FOR MAIN GAS. PLC ALARMS WHEN MAIN GAS PRESSURE IS HIGH, AS WELL AS BCU PRE INTERLOCK.

PS3 (PSL-110) - PRESSURE SWITCH Lo FOR PILOT GAS. PLC ALARMS WHEN PILOT GAS PRESSURE IS LOW, AS WELL AS BCU PRE INTERLOCK.

PS4 (PSH-110) - PRESSURE SWITCH Hi FOR PILOT GAS. PLC ALARMS WHEN PILOT GAS PRESSURE IS HIGH, AS WELL AS BCU RUN INTERLOCK.

GM2 (GM-110) - 50 MICRON FILTER FOR PILOT GAS. KEEPS PILOT GAS TRAIN PROTECTED FROM LARGE PARTICULATES.

PT1 (PT-121) - PRESSURE TRANSMITTER. MEASURES CV HEADSPACE PRESSURE. PLC ACTIVATES ANTI-FOAM PUMP IF PRESSURE EXCEEDS SET POINT AND RUNS FOR A PRESET TIME PERIOD. PLC ALARMS AS CRITICAL IF CV HEADSPACE PRESSURE EXCEEDS HiHi (SH) SET POINT ON PLC.

AC1 (AC-150) - AIR COMPRESSOR SUPPLY FOR FV17 (DISCHARGE VALVE) AND FV20 (O2 SENSOR VALVE) WITH WITH PNEUMATIC ACTUATORS.

YT (YT-100) - UV SENSOR. SENSES THE FLAME AND PROVIDES A VOLTAGE SIGNAL INDICATING FLAME STRENGTH.

BL (BL-100) - IGNITOR/SPARKER TRANSFORMER. PROVIDES THE VOLTAGE REQUIRED FOR THE SPARK PLUG TO PROVIDE A SPARK DURING IGNITION.

QT1&2 (QT-100) - O2 LAMBDA SENSOR. SENSES AFER (EXCESS AIR) AND TRANSMITS TO PLC. PLC USES AFER READING IN "AUTO AFER" MODE TO RAMP CAF UP OR DOWN TO MAINTAIN AFER SET POINT FOR FUEL FLOW RATE SET POINT. BCU RUN INTERLOCK IF OUT OF RANGE. PLC ALARMS IN CRITICAL IF AFER IS OUT OF RANGE.

SO (SO-100) - FLAME ARRESTOR TO PROTECT GAS SUPPLY LINE UPSTREAM OF BURNER HEAD SHOULD A FLASHBACK OCCUR FROM THE BURNER HEAD. LOCATED IMMEDTIALEY UPSTREAM OF THE BURNER HEAD ON THE BV UNIT.

LEGEND FOR LABELS:

AC - AIR COMPRESSOR
BCU - BURNER CONTROL UNIT
BL - IGNITOR/SPARKER TRANSFORMER
CA - COMBUSTION AIR
CAF - COMBUSTION AIR FAN
CC - COMBUSTION CHAMBER
CKV - CV OVERFLOW VALVE
CV - CONCENTRATION VESSEL
FT - FLOW TRANSMITTER
FV - FLOW VALVE
GM - FILTER/Y-STRAINER
LC - LEVEL CONTROL
P - PUMP
PCV - PRESSURE CONTROL VALVE
PLC - PROGRAMMABLE LOGIC CONTROLLER
PS - PRESSURE SWITCH
PSV - PRESSURE SAFETY VALVE
PT - PRESSURE TRANSMITTER
PZ - PNEUMATIC ACTUATOR
QT - O2/LAMBDA SENSOR
SH - SAFETY Hi
SL - SAFETY Lo
TE - TEMPERATURE SENSOR
VFD - VARIABLE FREQUENCY DRIVE
YT - UV SENSOR
ZSC - PROOF OF CLOSURE SWITCH

CRITICAL SAFETY CONTROL INSTRUMENT

① BCU INTERLOCKS

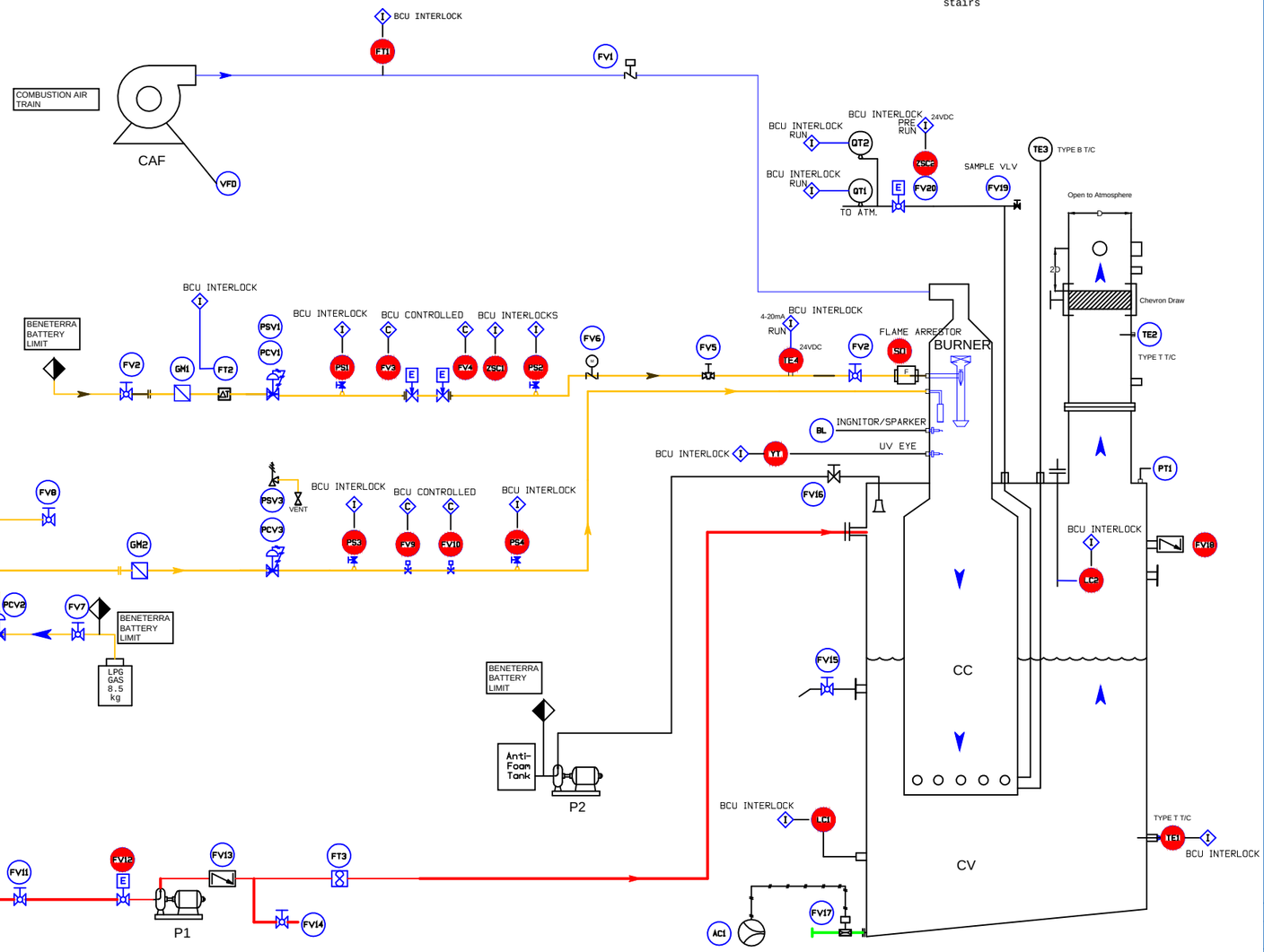
PRE INTERLOCKS
BCU:
-CA FT1 (FS130)
-PG FV3 & 4 (FV110 & 111)
-UV YT (YT 100)
PLC:
-CA FS130
-MG PS2 (PSH 100)
-MG ZSC1 (ZSC 102)
-PG PS3 (PSL 100)
-O2 ZSC2 (ZSC 103)

RUN INTERLOCKS
BCU:
-CA FT1 (FS130)
-MG FV9 & 10 (FV101 & 102)
-UV YT (YT 100)
PLC:
-CA FS130
-MG PS1 (PSL 100)
-PG PS4 (PSH 100)
-CV LC1 (PT 120 HH)
-CV LC1 (PT 120 LL)
-CV LC2 (LSHH 120)
-CV TE1 (TE 120 Hi)
-MG TE4 (TE 100 Hi)
-MG FT2 (FT 100) RANGE
-QT1 & 2 (QT 100) RANGE
-O2 ZSC2 (ZSC 103)

Ⓒ BCU CONTROLLED

-FV3 & 4 (FV-101 & FV-102)
-FV9 & 10 (FV-110 & FV-111)

ESTOP: On main control panel, and at trailer level adjacent to stairs



APPLIANCE FUNCTIONAL TESTING									
INSTR.	PASS	INSTR.	PASS	INSTR.	PASS	INSTR.	PASS	INSTR.	PASS
FT1		ZSC1		PCV3		FV11		FV18	
FV1		PS2		PS3		FV12		PT1	
FV2		FV5		FV9		FV13		TE2	
FT2		TE4		FV10		FT3		TE3	
PCV1		FV2		PS4		LC1		FV19	
PS1		FV6		BL		FV17		ZSC2	
FV3		FV7		YT		TE1		QT1	
FV4		PCV2		FV16		LC2		QT2	

COMISSIONING SIGN-OFF		
	NAME & LICENCE #	SIGNATURE & DATE
BENETERRA		
INSPECTOR		

Notes:

AS CONSTRUCTED CONTROL LOGIC FOR
BV150-A02-GERTRUDE

FABRICATION & ASSEMBLY COMPLETED IN:
JULY 2018

COMMISSIONED ON:
26th JULY 2018

REV:	DESCRIPTION:	BY:	DATE:

STATUS: PRELIM

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CLIENT: BENETERRA PTY LTD

SITE: BV150-A02-GERTRUDE
WASTEWATER EVAPORATOR

TITLE: CONTROL LOGIC & FUNCTIONAL TESTING

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2023-11-10	RVN	SH

PROJECT NO:	DRAWING NO:	REVISION:
BV150A02	BV150A02CL	6