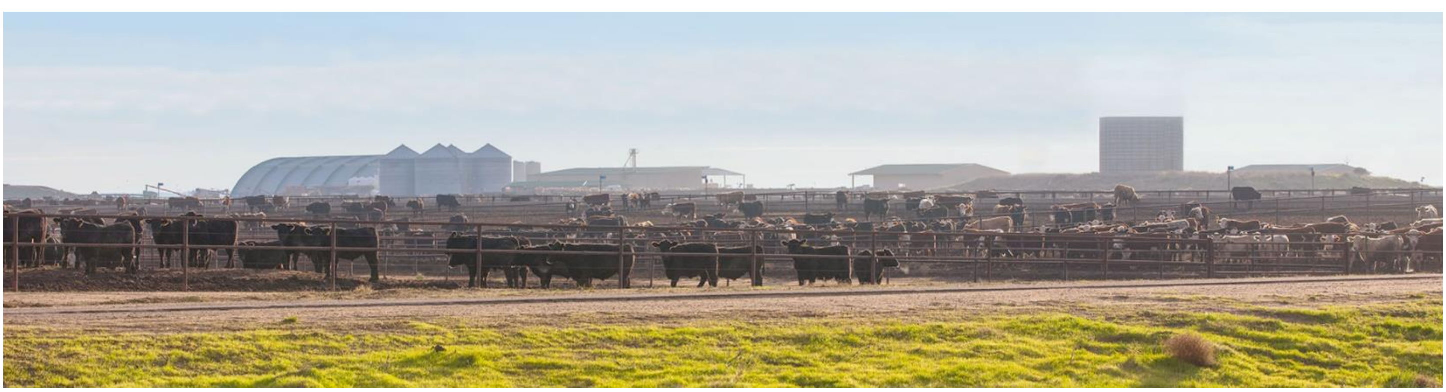
UAG BioNutrients & Ravensworth Ramps Ridge Feedlot

UAG Bio Nutrients Facility

Environmental Impact Statement



Environmental Impact Statement

UAG Bio Nutrients Facility at Ravensworth Ramps Ridge Feedlot

Executive Summary

This environmental impact statement has been prepared by UAG Bio Nutrients for the proposed development of a bionutrient facility at Ravensworth Ramps Ridge Feedlot located at Lot 2 DP 1245331, Sturt Hwy, Maude NSW. The site is an integrated development in RU1 Primary Production zone, DA: 1990-002, approved to stock 60000 head of cattle at a stocking density of $9m^2$/hd. It is proposed that a UAG Bio Nutrient facility pilot plant be constructed at the feedlot which will convert current biosolid waste streams of cow manure and other organic wastes into biogas and organic fertilizer products (BioH70). Biogas produced at this facility will be used to produce net positive electricity supply to power the facility, with surplus gas routed to Ramps Ridge combined heat and power generators and flaking system to produce electricity for use within the feedlot operations. The project is integral to UAG Bio Nutrients' and Ravensworth Agriculture Company's aim to provide state of the art carbon neutral facilities which align with the Federal Governments 2050 net zero emissions target.

The proposed development will provide a proven fully enclosed Bio Nutrients facility, constructed by UAG Bio Nutrients, which will convert the feedlots current agricultural organic waste streams into significant positive net biogas production, capable of supplying the feedlot with 5638MWh of biogas annually. Substrates from the anaerobic digestion process after biogas production will be processed through highly advanced and fully automated BioN vermiculture modules for enzymatic and biological improvement, creating approximately 7600 tonnes of premium quality organic fertiliser BioH70 for sale/supply to the primary production industry. Ravensworth Agricultural Company intends to use BioH70 fertiliser to run plot trials within its cotton plantation, whilst surplus BioH70 will be supplied to external holdings. The installation of the UAG Bio Nutrients facility will provide a significant contribution to renewable energy production, eliminates waste streams, captures significant greenhouse gas emissions equivalent to 14283 tonnes CO_2 annually, and provides large volumes of organic fertilizer contributing to carbon capture and soil improvement in an environmentally sustainable manner.

Applicant: UAG Bio Nutrients Limited

Development Type: Regionally Significant Development

Capital Investment Value: $15 000 000

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1.0 Introduction

UAG Bio Nutrients focus is to support the development of sustainable circular economies within regional Australian agriculture and seeks to integrate projects which catalyse industry decarbonization and align with United Nations Sustainable Development Goals. In accord with these goals, UAG Bio Nutrients is seeking approval to construct and operate a bionutrients pilot plant within the Ravensworth Agricultural Company's Ramps Ridge Feedlot Facility.

The UAG Bio Nutrients process supports environmentally sustainable agricultural production, capturing methane from the feedlots organic waste and converting it to clean heat and electricity for both the UAG facility and the Ravensworth Ramps Ridge feedlot operations. This significantly reduces harmful greenhouse gas (GHG) emissions from the feedlot operations. The UAG process also produces multiple revenue streams, including the production of a globally unique organic carbon rich fertilizer, BioH70, which rebuilds soil structure and fertility. Appropriately registered farmers will be able to claim carbon credits from the use of the BioH70 fertiliser from the UAG facility. CO_2 capture and sale provides further revenue and progress towards reduced GHG emissions and environmental improvement.

The UAG process is independently verified and supported by critical elements and fertilizer analysis from our working research and development facility in the Northern Rivers Region of NSW. The principle of designing out waste and pollution to provide clean power and carbon credits for carbon neutral feedlot processing increases revenue and decreases operating costs. It also provides sustainable inputs for farmers, building natural capital and enabling environmental regeneration, whilst creating regional employment opportunities. The UAG philosophy is illustrated below in Figure 1.

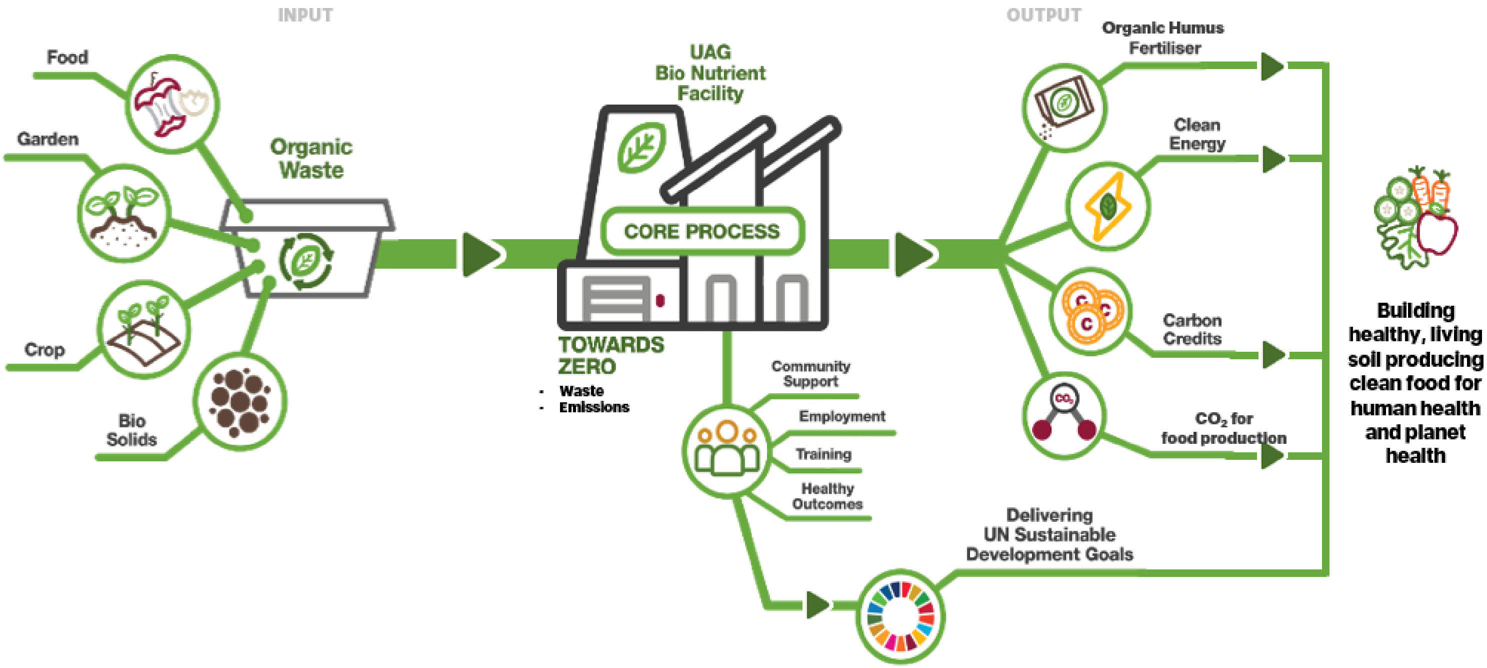


Figure 1: The UAG Bio Nutrients core philosophy

Ravensworth Agricultural Company is one of the largest employers in the Hay region with established international relations with investment grade companies in China, Japan, Korea, Singapore and Australia, with aims to increase its capacity and strengthen its regional and global influence. Integral to this drive is a strong desire to install renewable energy systems, designed to facilitate carbon neutral production, which aligns with the Federal Governments 2050 net zero emissions target and supports the delivery of the Australian red meat industry's target of achieving carbon neutrality by 2030. Government has recognized that regional Australia is central to achieving continued reduced emissions and aims to ensure that the right infrastructure is in place as sectors decarbonize.

The power industry is a sector that particularly burdens the environment, especially since it is based mainly on conventional (nonrenewable) resources, i.e. hard coal, crude oil and natural gas. An alternative to burning fossil fuels is the production of energy from renewable sources such as wind, water, sun, geothermal resources, and biomass. Electricity production from biomass via anaerobic digestion has been identified as the most efficient prospect for Ravensworth Ramps Ridge Feedlot facility. The installation of a UAG Bio Nutrient facility provides 5638MWh towards renewable energy production while also producing approximately 7600 tonnes of premium quality BioH70 organic fertiliser for use within primary production industries.

Existing on-site organic waste streams (cow manure and organic matter) will be decomposed in anaerobic digestion tanks. All water used for this process (approx. 4.2ML) is sourced from the feedlots existing effluent pond. The resulting in biogas is purified and compressed before being routed to combined heat and power units (CHP) to produce electricity. The construction and operation of such an installation represents a major resource for the Ravensworth Ramps Ridge Feedlot facility, who currently receive their electricity supply from Origin at considerable expense or from diesel powered generators. Ravensworth Agricultural Company also intends to apply produced BioH70 fertiliser throughout extensive plot trails in their cotton farming enterprise to increase organic carbon content and regenerate soil structure and fertility.

Currently all manure and organics from site are stockpiled in rows before being ploughed into soil. The stockpile storage of manure currently practiced on-site creates an anaerobic system which constantly vents methane into the atmosphere. Methane is proven to have 25 times the global warming potential of carbon dioxide. Stockpiles of manure on the scale produced at Ramps Ridge feedlot therefore represent a significant environmental hazard through GHG emissions averaging 5859 tonne of CO_2 equivalent annually. UAG Bio Nutrients and Ravensworth seek to convert this wasted resource into biogas to be used for energy production, drastically reduce operating costs, reducing GHG emissions and attaining carbon neutral beef production for this facility.

A UAG Bio Nutrient plant is an asset that makes it possible to rationally solve the problem of managing various organic wastes, supporting the generation of sustainable electricity and heat as well as digestates which can be processed and improved through vermiculture into premium organic fertilizer products. This process significantly reduces harmful methane emissions normally produced by the agricultural sector. The UAG Bio Nutrient pilot plant proposed in this development will convert current on-site waste streams to contribute 5638MWh towards renewable energy production, reduce damaging greenhouse gas emissions by 14283 $_{t}CO_2eq$/annum, and provide 7600 tonne of premium organic fertilizer annually facilitating carbon capture and soil improvement. These concepts are central to UAG Bio Nutrients philosophy of circular sustainable economies which improve our natural environment and move our regional communities closer to carbon neutral production.

1.2 Location

The Ravensworth Ramps Ridge feedlot facility is located at 32570 Sturt Hwy, Hay , 17 km south of Maude and 58km WSW of Hay in the Riverina Region of NSW. The proposed UAG Bio Nutrient pilot plant will be located on a building envelope to the south west of the feedlot and south of the current water storage reservoir of the land contained in Lot2 DP:1245331.

Site locations are shown in Figures 2 and 3.

It is expected that the bionutrient facility will have a footprint of approximately 2.5 hectares within the identified building envelope, including the temporary allocation of area required for on-site manufacturing and commissioning, and any required easements for access.

The subject land is zoned (RU1) Primary Production under the Hay Local Environmental Plan 2011. Whilst the LEP does not specifically state that 'Composting Facilities' or 'Waste Management Facilities or Work's' are a permissible form of development, Division 4-34, (1)(b), (4) of the *State Environmental Planning Policy (Infrastructure) 2007* states that electricity generating works may be carried out in the prescribed rural zone, including that of a waste or resource management facility for the purpose of electricity generating works that generate energy from waste. Anaerobic digestion facilities, as per this proposal, are classified as a type of 'Waste or Resource Management Facility".

No part of the site is situated in areas designated as wetlands, coastal zones, mountain and forest areas, nature reserves and parks, special protection areas, densely populated areas or landscapes of historical cultural or archaeological significance

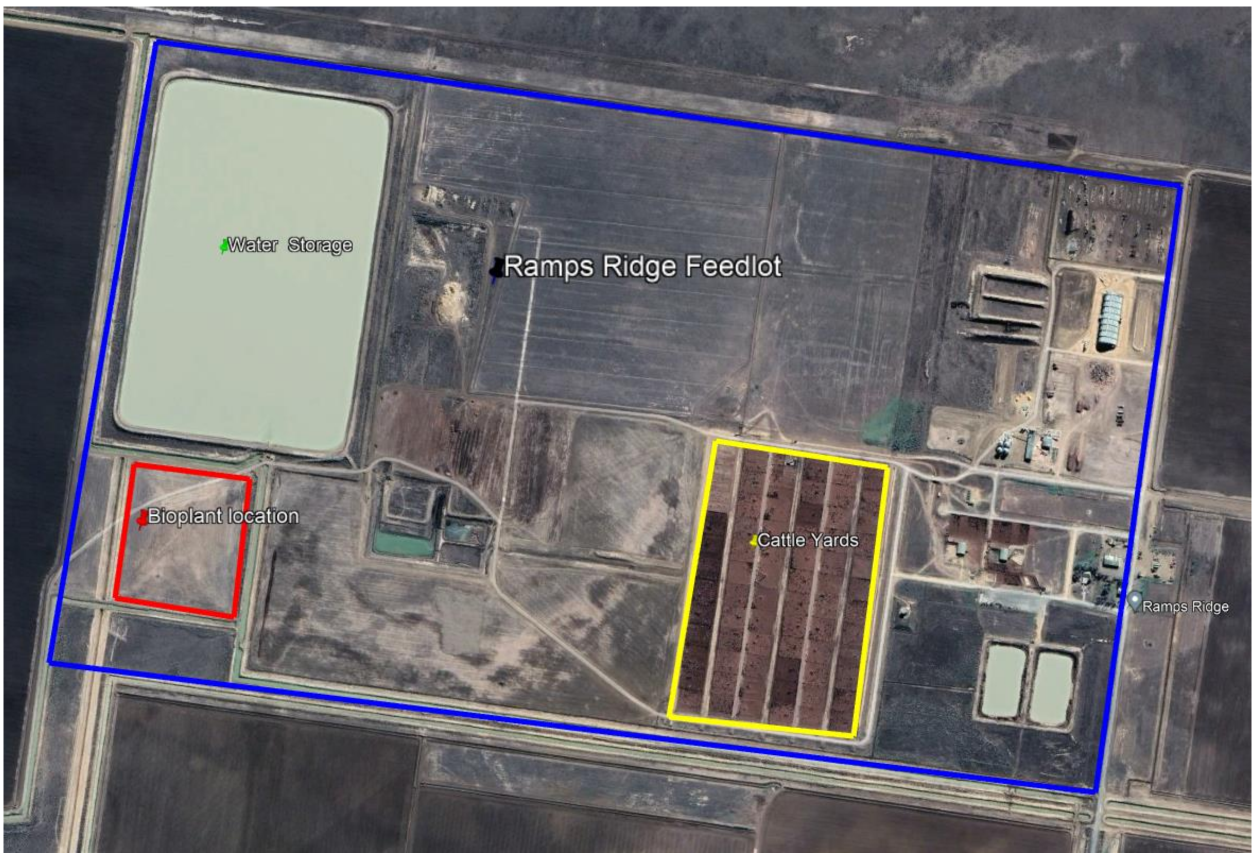


Figure 2: Ravensworth Ramp's Ridge Feedlot overview with proposed bionutrient facility location.

Figure 3: Ravensworth Ramp's Ridge Feedlot location.

1.3 Soils and Hydrology

The project location is listed on the Australian Soil Classification eSpade datasets as level 5 Land and Soil capability indicating severe limitations. Soil type is predominantly Kurosol clay loam with a pH of 6-6.5 and of moderate fertility. The land is classified Alum 18-class-grazing, modified pasture (Land Use 2007). Soil organic carbon is 0.5 to 1%. The area is not affected by acid sulfate soils, and there is little to no salinity evident. Average annual rainfall is low at 367mm, and modelled erosion hazard is nil to slight at ≤20t/ha/yr.

2.0 Project Description

The proposed development will involve the construction and operation of a best practice UAG Bio Nutrient Facility receiving organic waste material from the onsite Ramps Ridge Feedlot (cow manure and other organic waste material). Feedstock for the biogas facility will be mixed with effluent water from the feedlot to the required Dry Solids Ratio. This will minimize the use of external clean water input to the system. The facility is fully enclosed. Biogas will be collected from 4 Anaerobic Digestion (AD) chambers, purified by Pressure Swing Adsorption (PSA) and routed to Combined Heat and Power (CHP) units to generate net positive electricity supply to the bionutrient facility. All working components of the facility will be in individual sealed and vented cells enabling quick and easy isolation when required for maintenance and repairs. The remaining biogas supply will be routed to the Ramps Ridge feedlot CHP units for power generation and heating for the flaking systems, reducing their dependence on fossil fuels. No biogas or electricity will be exported from site. Substrate from the AD chambers will be processed through advanced BioN vermiculture modules, where enzymatic and biological improvement effectively eliminates all pathogen content and toxicity, transforming the substrate into premium quality BioH70 organic fertilizer, producing both solid pelletized and liquid products for application. A project overview of the biogas facility mass balance and environmental influence can be seen in Figure 4, highlighting the conversion of current waste streams into significant carbon capture, biogas production and valuable soil improvement products, supporting the Ravensworth Ramps Ridge Feedlot aims towards carbon neutral beef production.

Site plans providing an overview of the proposed development and operations are given in Figures 5, 6 and 7.

Key operational features of the development within the 2.5 ha footprint include:

- Plant production and assembly Area
- Receival area
- 4 Anaerobic Digestion tanks
- 3 Pretreatment tanks
- 2 Combined Heat and Power units (CHP) with gas treatment and flare
- Compressed gas storage tanks
- Vermiculture facility
- Humus collection and processing facility
- Office, Amenities and Maintenance
- Car parking area
- Landscaping

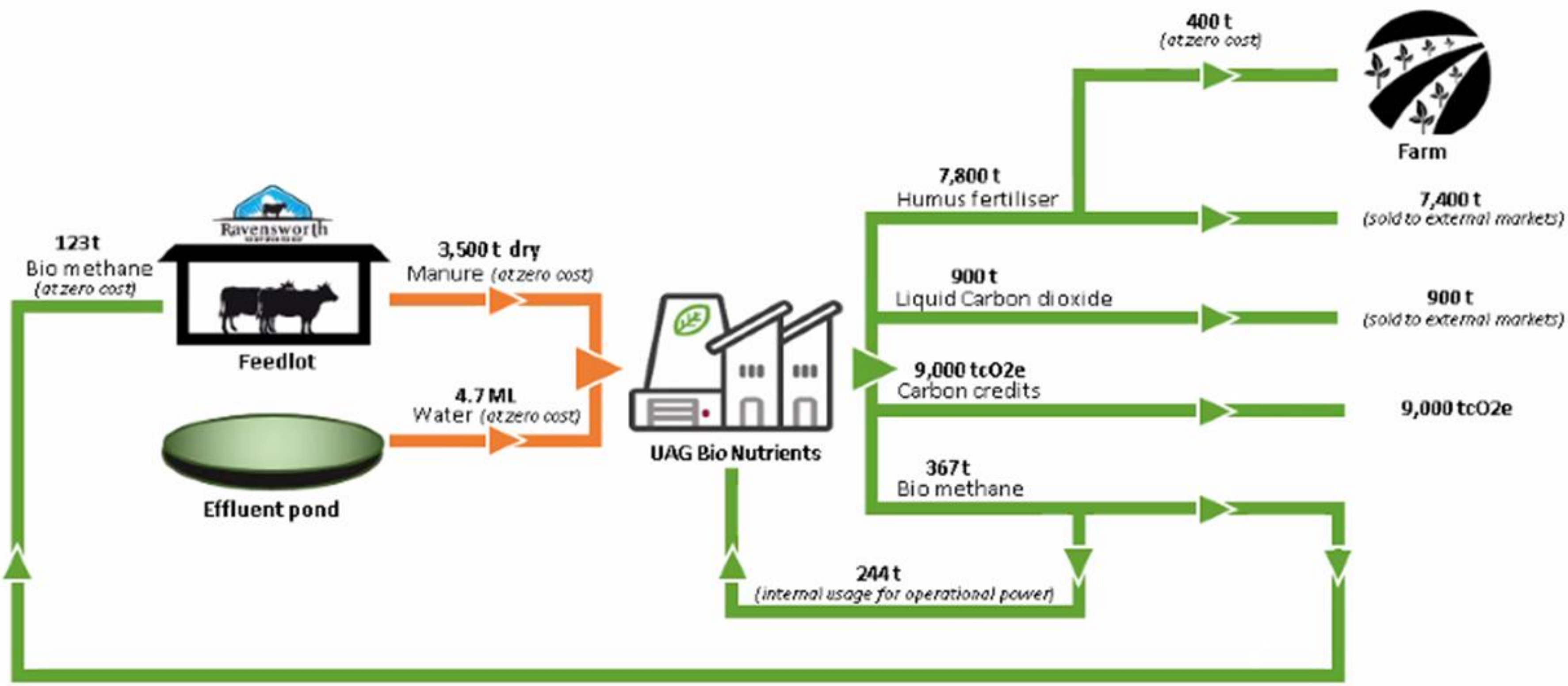


Figure 4: UAG Bio Nutrients Project overview

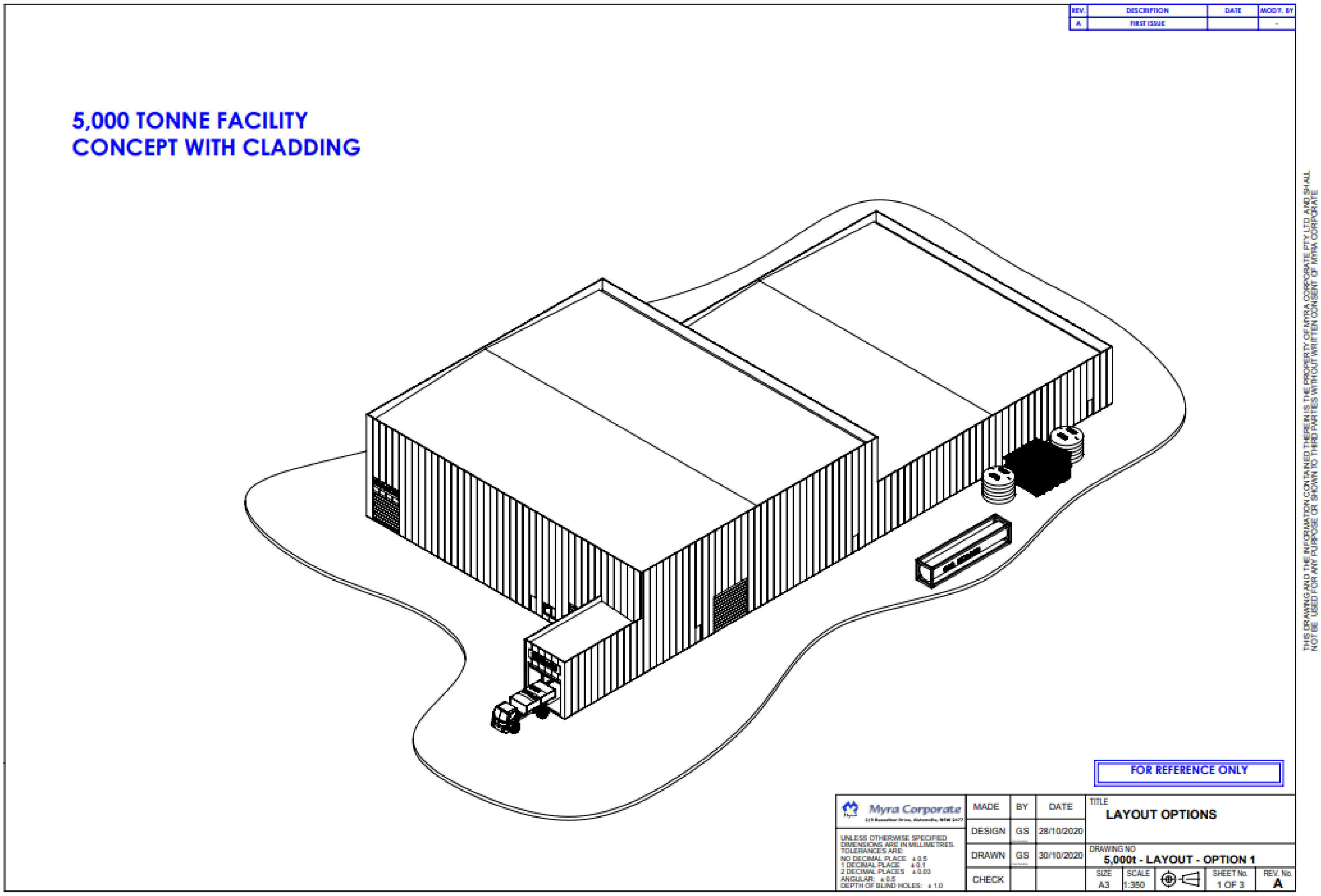


Figure 5: UAG Bio Nutrients facility concept drawing with cladding

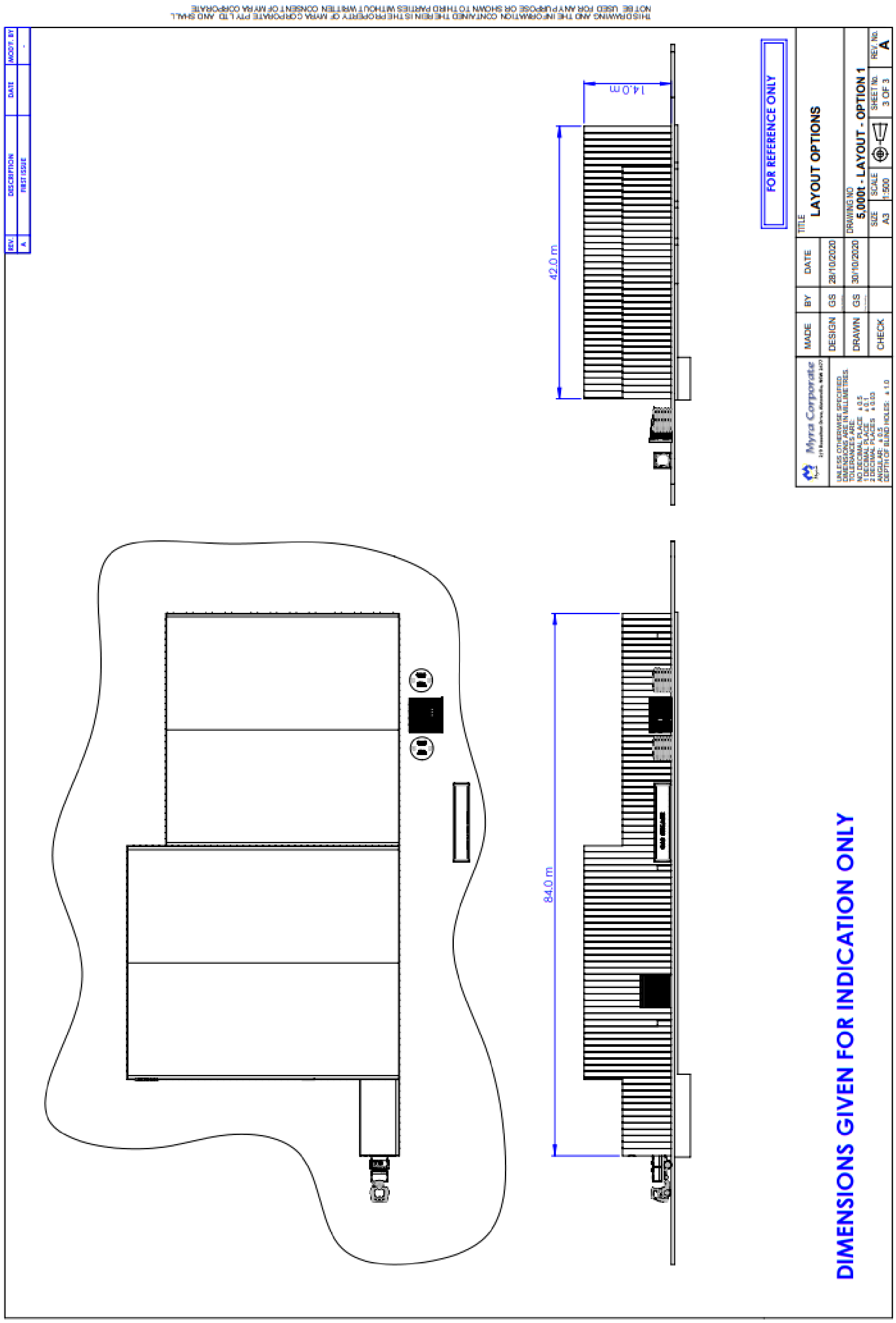


Figure 6: UAG Bio Nutrients facility concept drawing with dimensions.

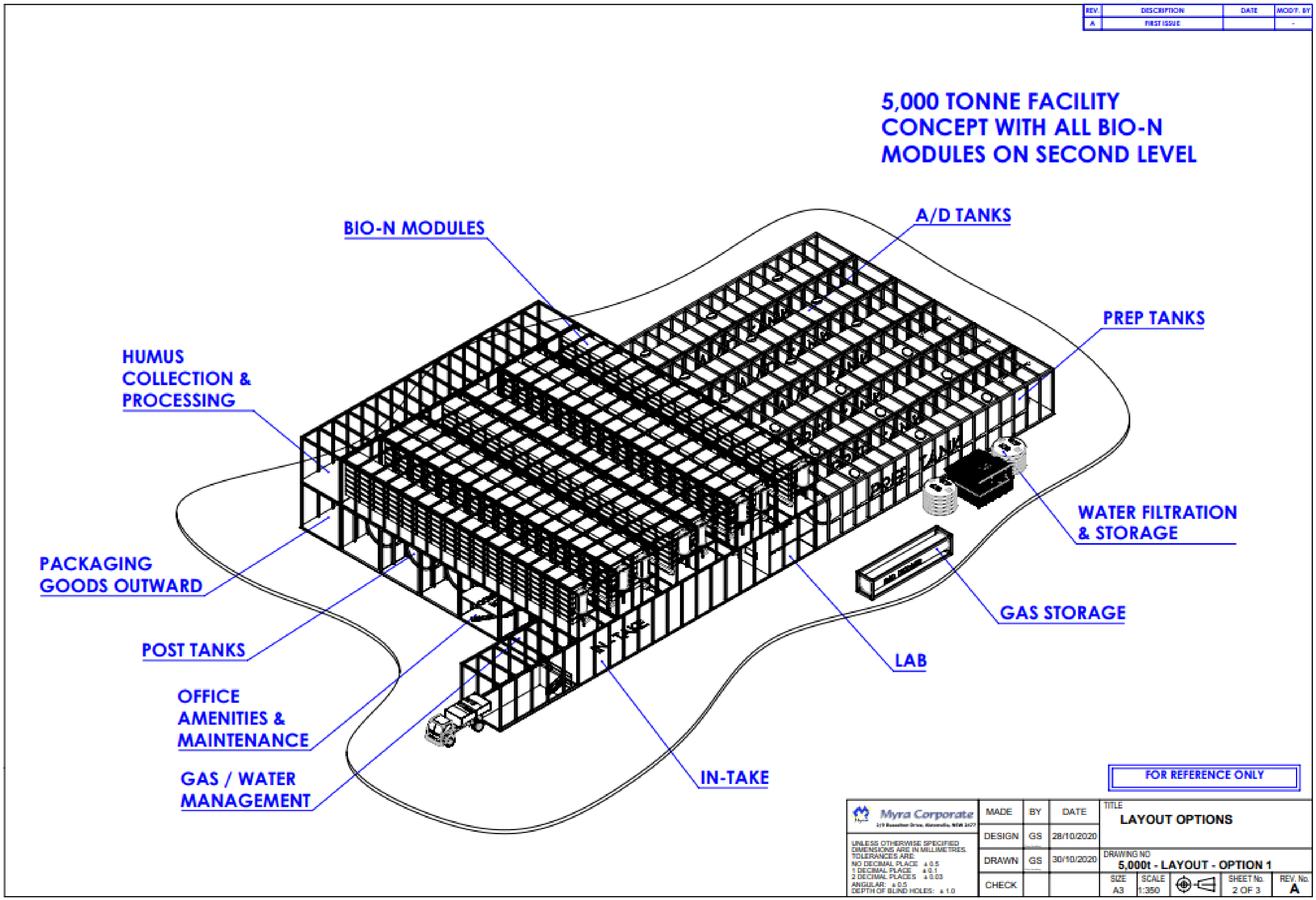


Figure 7: UAG Bio Nutrients facility skeletal structure and layout.

2.1.1 Plant Production and Assembly Area

All anaerobic chambers and biogas plant components will be manufactured onsite. The area required for this will be approximately 8800m^2, and will be laid out as shown in Figure 8. Covered assembly and production machinery areas will be concrete. Two portable diesel generators will be required for plant production, which will be housed in an acoustic chamber minimizing noise emission. All plant materials will arrive precut and drilled, so there will be minimal grinding or welding during manufacture of the entire facility. The production process is designed to produce no waste.

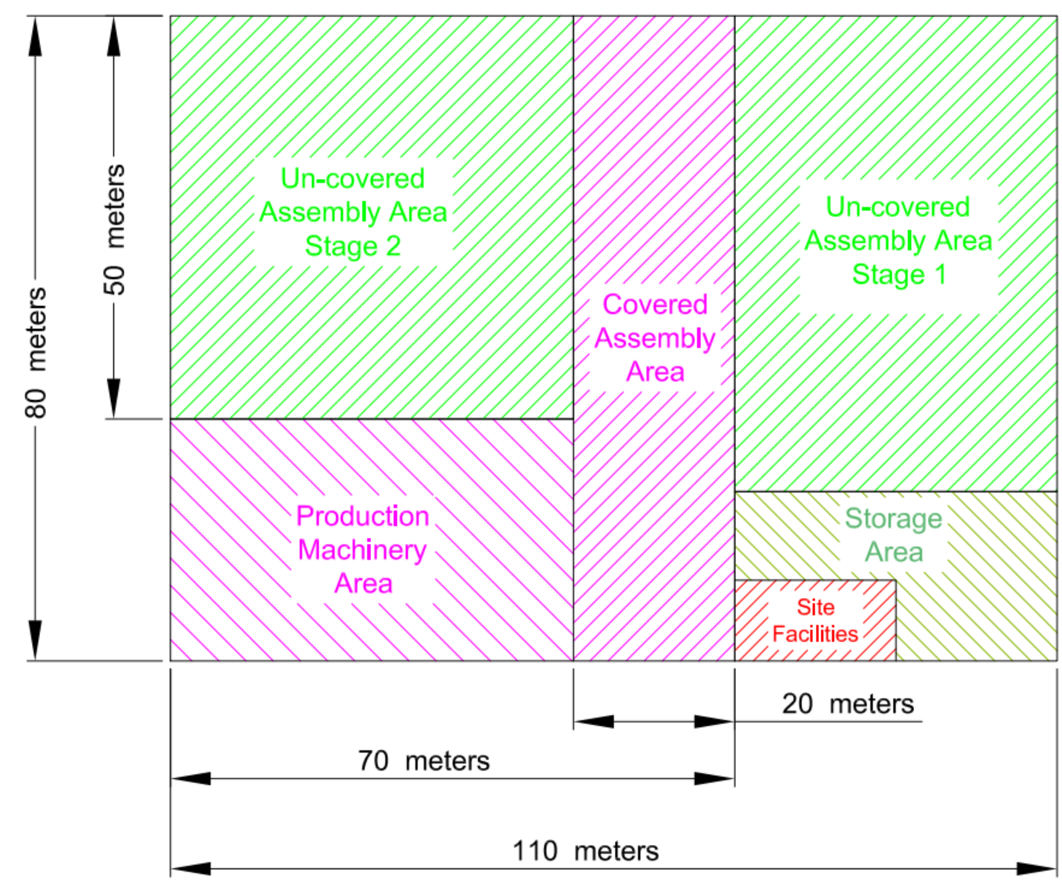


Figure 8: UAG Bio Nutrients plant production and assembly area

2.1.2 Receival Area

A receival area will be situated at the front façade of the main plant for receiving truckloads of feedstock from on-site. This area will be one single 72m^2 covered concrete bay with cement bunding to contain nutrient runoff. Waste stream feedstock will be received at 20% moisture content and delivered by tip truck. Access will be limited to trucks from the Ramps Ridge Feedlot facility only.

2.1.3 Preparation Tanks

There will be a total of 3 preparation tanks within the facility, each with a volume of 300m^3. These tanks will be manufactured on site from high-density polyethylene using a process that produces no waste. The preparation tanks are a batch systems cycled through a fill and empty system. Effluent water from the feedlot will be mixed with received feedstock within these tanks and elevated to target temperature. A slow speed shredder will be used to homogenize organic matter particle size before introduction to the preparation tanks. No chemical application is required during the feedstock preparation process. The effluent generated by the feedlot will be used as dilution water, minimizing the need for fresh potable water to be added for this process. The prepared feedstock is then added to the anaerobic digestion chambers.

2.2.1 Anaerobic Digestion Tanks

During the biogas production process, feedstocks from Ramps Ridge Feedlot that will be introduced into the digesters are decomposed by anaerobic bacteria under optimal living conditions. The anaerobic digestion tanks will have a diameter of 4m and a length of 30m with horizontal alignment. The AD tanks will be manufactured on site to strict structural engineering and analysis standards and have been subject to Finite Element Analysis, as shown in Figure 9. No waste will be produced during the manufacturing process.

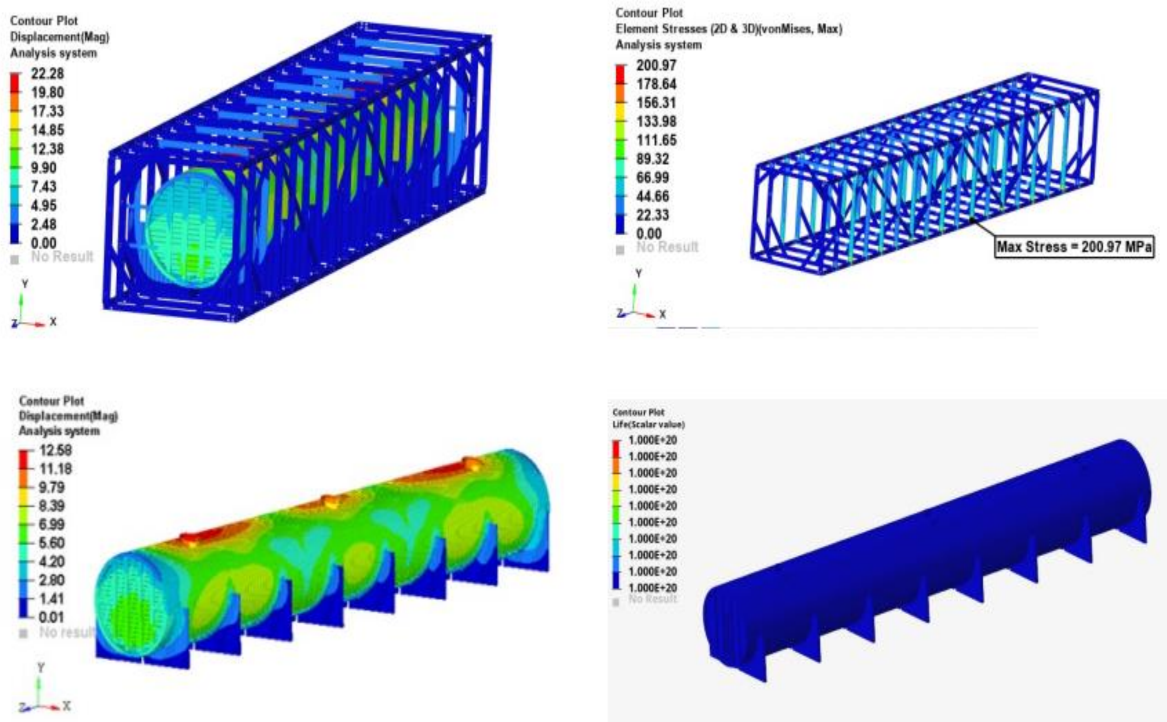
The proposed plant consists of four tanks that are made of high-density polyethylene. These chambers will be operated under strict temperature control. All nutrients required for the microorganisms (MOs) to proliferate will be contained in the feedstock and no additional chemicals or innoculants are required for the process. Once the tank is filled and inspection hatches closed, the tunnel is purged with CO_2 (a byproduct of the AD process and captured on site) to render the tunnel oxygen-free. The anaerobic digestion tanks are fully sealed continuous plug-flow systems which remain full at all times, with tank input and output occurring simultaneously. Tanks are externally agitated using high frequency low noise pumps. Heating mechanisms are also external, allowing for easy maintenance/repair of these elements.

During anaerobic digestion the biomass is converted into biogas in four phases:

- First Phase – Hydrolysis
- Second Phase – Intermediate Product Formation
- Third Phase – Acidogenesis
- Fourth Phase – Methanogenesis

The feedstock sits inside the tanks for a period of approximately 4 weeks while biogas is produced. The gas is then purified using pressure swing adsorption (PSA) to remove CO_2 before being routed to the gas storage tanks. Gas sensors will be employed throughout all component units to ensure safe working and environmental conditions

Finite Element Analysis



Structural integrity has been verified for a 3-story structure under cyclonic conditions through Finite Element Analysis.

From the fatigue analysis, tank life is estimated at over 20 years as the parts are within yield value.

Figure 9: Structural finite analysis of anaerobic digestion tanks.

2.2.3 Post Digestion Tanks

Substrate removed from the anaerobic digestion tanks is routed to the post digestion tanks. Post digestion tanks are assembled on site and made from high density polyethylene to a volume of 300m3. These are batch systems that are cycled through a fill and empty system, where exhausted substrate is allowed to cool and energy recovered. Substrate is subject to quality control analysis and stabilization before insertion into the vermiculture system.

2.3.1 Pressure Swing Adsorption System

Pressure swing adsorption is a safe process used extensively for CO_2 separation and methane purification. This is a molecular sieve filtration method and CO_2 is removed by vacuum. All parameters of the installed system, including feed stream pressure, working temperature, material properties and safety requirements will comply with Australian Standard ISO/TS 19883:2017, MOD Safety of pressure swing adsorption systems for gas separation and purification (Standards Australia Limited 2020). Cryogenic condensation is applied for gas liquification. Any gas impurities removed are inserted into the fertilizer production process as essential elements.

2.3.2 Gas Storage Tanks

Post purification both methane and CO_2 will be compressed and routed to storage tanks. Safety is the fundamental objective of UAG Bio Nutrients, and all gas handling and storage procedures will adhere to Australian Standard AS 3961:2017 The storage and handling of liquified natural gas (Standards Australia Limited 2020). There will be one liquified CO_2 storage tank with a 25000L capacity ($25m^3$) providing storage for approximately 1 months' worth of CO_2 production. There will be 1 liquified methane storage tank with a 25000L capacity, which corresponds to around 24hrs biogas production. Gas sensors will be used throughout the Bio Nutrients system to ensure safe working and environmental conditions.

2.3.3 Combined Heat and Power Units

Biogas is then combusted in combined heat and power units (CHP) which generate electricity and heat to be used for the operations of the UAG Bionutrients plant operations. Surplus biogas is to be routed to the Ramps Ridge Feedlot Facility CHP units via an underground piping system for their use in their renewable energy production and steam flaking mill (Ramps Ridge piping and CHP units are subject to independent assessment and DA approval).

Specially designed gas engines are used for this process, a typical installation being shown in Figure 10. In case of failure of the CHP the biogas is stored in the compressed gas tank or is safely eliminated as it is burned by the installed flare.

Preliminary modelling has shown that at full capacity (5000 tonnes/year) the bioenergy facility will offset all grid consumption for the UAG Bionutrients facility and the Ravensworth Ramps Ridge Feedlot, therefore offseting both volume charges ($/kWh) and network peak demand charges ($/kVA).

Figure 10: A typical CHP unit powered by biogas.

2.4.1 Vermiculture facility

Substrate removed from the anaerobic digestion tanks will be processed through a contemporary fully automated, climate controlled, continuous flow, industrial scale vermiculture unit. The vermiculture units are constructed on site. Access to the vermiculture room is limited and covered by biometrics system for biosecurity purposes. Entry will be via isolation chamber. This facility will be located on the second floor level above the humus collection and processing facility and office/laboratory sections. The vermiculture process enhances the substrate from the anaerobic digestion process via enzyme and bacterial addition, mitigating toxicity and converting the used substrate into premium quality humus-effective carbon-based BioH70 fertilizer, providing a value-added product from the feedlot waste stream. There are no chemicals involved in the production of this organic fertiliser. In contrast to the use of inorganic mineral fertilizers, long-term fertilization with the organic humus-based product contributes to maintaining soil fertility as well as soil life and to ensuring high-yield sites that can be sustainably utilized. The UAG Bio Nutrients vermiculture process is designed to mitigate risks associated with traditional anaerobic digestion substrates and produce a safe, premium quality organic fertilizer.

2.4.2 Humus Collection & Processing Facility

Humus collected from the vermiculture facility will be separated into liquid and solid fertilizer products. A screw press will be used to remove liquid from the solid bio humus product, which will then be packaged for ready distribution and application. The remaining solid substrate will then be pelletized and stored in holding hoppers for truck distribution. Storage of bulk packaged fertilizer will be accommodated here.

2.5.1 Office, Amenities and Laboratory

An office, amenities and laboratory section will be included in this proposal. The water/sewerage/kitchen waste from this facility will be processed through septic system. The laboratory will be modest with no requirement for hazardous chemicals.

2.5.2 Car Parking Area

There will be a carpark area included with a capacity for 6 vehicles to accommodate workers and visitors to the complex. The carpark will be located at the front façade of the Bionutrients facility.

2.5.3 Landscaping

Landscaping will be applied to the entrances surrounding the facility and carparking area. This will include vertical gardens on the front façade of the building, ensuring a pleasing visual amenity for the facility.

3.0 *Strategic and statutory context*

The relevant NSW legislation includes:

- Environmental Planning and Assessment Act 1979;
- Environmental Planning and Assessment Regulation 2000;
- State Environmental Planning Policy (State and Regional Development) 2011
- Protection of the Environment Operations Act 1997;
- Waste Avoidance and Resource Recovery Act 2001;
- Biodiversity Conservation Act 2016
- DPI Biosecurity Strategy 2013-21
- NSW "Waste Less, Recycle More 2017-2021"

3.1.1 Environmental Planning and Assessment Act 1979

The proposed development is consistent with the overall objectives of the Environmental Planning and Assessment Act 1979. Section 5 of the Environmental Planning and Assessment Act 1979 and the accompanying Regulation provide the framework for environmental planning in NSW and include provisions to ensure that proposals which have the potential to impact the environment are subject to detailed assessment, and to provide opportunity for public involvement. The proposed development is consistent with the nominated objectives of the Act and is considered capable of fulfilling the statutory requirements. The site investigations have determined that the proposed development will not result in any significant negative impacts that cannot be adequately mitigated or managed. ***The proposed project is not a designated development requiring assessment under Part 4 of the Environmental Planning and Assessment Act 1979.***

3.1.2 Environmental Planning and Assessment Regulation 2000

Under Schedule 3, Clauses 13(a) and (b) of the Environmental Planning and Assessment Regulation 2000, 'Composting Facilities or Works' that process organic materials are considered Designated Development and require an Environmental Impact Statement if they:

(a) purify, recover, reprocess or process more than 5,000 tonnes per year of solid or liquid organic materials, or

(b) that are located:

(i) in or within 100 metres of a natural waterbody, wetland, coastal dune field or environmentally sensitive area, or

(ii) in an area of high watertable, highly permeable soils, acid sulphate, sodic or saline soils, or

(iii) within a drinking water catchment, or

(iv) within a catchment of an estuary where the entrance to the sea is intermittently open, or

(v) on a floodplain, or

(vi) within 500 metres of a residential zone or 250 metres of a dwelling not associated with the development and, in the opinion of the consent authority, having regard to topography and local meteorological conditions, are likely to significantly affect the amenity of the neighbourhood by reason of noise, visual impacts, air pollution (including odour, smoke, fumes or dust), vermin or traffic.

The proposal will be not be considered designated development under Schedule 3 of the Environmental Planning and Assessment Regulation 2000, as

- ***the processing capacity does not exceed 5000 tonnes per annum Schedule 3, Clause 13(a), and:***
- ***does not trigger concern regarding conditions listed in Schedule 3, Clause 13(b).***

3.1.3 State Environmental Planning Policy (State and Regional Development) 2011

A regional development needs to be notified and assessed by a council and then determined by the relevant Planning Panel, which is the Western Regional Planning Panel for the Local Council Area of Hay, NSW. Regional development is defined in Schedule 7 of the State Environmental Planning Policy (State and Regional Development) 2011 and includes:

• Development with a capital investment value (CIV) over $30 million

• Development with a CIV over $5 million which is:

- council related
- lodged by or on behalf of the Crown (State of NSW)
- private infrastructure and community facilities
- eco-tourist facilities.

• Extractive industries, waste facilities and marinas that are designated development

• Certain coastal subdivisions

• Development with a CIV between $10 million and $30 million which is referred to the Planning Panel by the applicant after 120 days

As the Capital Investment Value (CIV) of the project is approximately $15 million, and the project is private infrastructure, the project is classed as Regionally Significant Development. Application to council will need assessment through consent authority being the Western Regional Planning Panel.

3.1.4 Protection of the Environment Operations Act 1997

The Protection of the Environment Operation Act 1997 (POEO Act) prohibits any person from causing pollution of waters, or air and provides penalties for air, water and noise pollution offences. Section 48 of the Act requires a person to obtain an Environment Protection License (EPL) from the NSW Environment Protection Authority before carrying out any of the premise-based activities described in Schedule 1 of the Act.

Schedule 1 of the Act (clause 12) details “Composting” as an activity. The relevant activity which applies to this development is:

• Composting, meaning the aerobic or anaerobic biological conversion of organics into humus-like products by methods such as bioconversion, biodigestion or vermiculture or by size reduction of organics by shredding, chipping, mulching or grinding

This activity is declared to be a scheduled activity if it meets the following criteria:

If the premises are in the regulated area:

(a) it has on site at any time more than 200 tonnes of organics received from off site, or

(b) it receives from off site more than 5,000 tonnes per year of non-putrescible organics or more than 200 tonnes per year of putrescible organics.

As the proposed facility in the regulated area will not process more than 200 tonnes of putrescible organics, and will not receive more than 5000 tonnes per year of non-putrescible organics from off site per year, an Environment Protection Licence for the facility will not be required from the NSW EPA.

3.1.5 Biodiversity Conservation Act 2016

The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest wellbeing of the community, now and into the future, consistent with the principles of ecologically sustainable development.

The Biodiversity Conservation Act 2016 and the supporting Regulations establish a modern and integrated legislative framework for land management and biodiversity conservation. Biodiversity elements include major innovations to offsetting and private land conservation, as well as improvements to threatened species conservation and how we manage human-wildlife interactions. The Act and its Regulations are administered by the Office of Environment and Heritage.

Given the site for this proposal requires no clearing of native vegetation and access roads are already in place, consideration of the Biodiversity Conservation Act 2016 is not required as part of the proposed development. An assessment of the need for Biodiversity Offsets is not required to be undertaken as part of the EIS.

3.1.6 Approvals/Licenses Required

The development is not considered to be a Designated Development under Environmental Planning and Assessment Regulation 2000.

For Designated Development an environmental impact statement will be required and third parties must be notified and can appeal against a decision to grant consent. Designated

Development refers to developments that are high-impact developments (e.g. likely to generate pollution) or are located in or near an environmentally sensitive area (e.g. a wetland). There are two ways a development can be categorised as 'designated development':

- The class of development can be listed in Schedule 3 of the EP&A Regulation as being designated development, or
- A LEP or SEPP can declare certain types of development to be designated.

Examples of designated development include chemical factories, large marinas, quarries and sewerage treatment works and waste management facilities or works.

The proposed development is not classed as a Designated Development and does not require an Environment Protection Licence from the NSW Environment Protection Authority as an Organic Recycling Facility, as the site has a processing capacity is less than 5000 tonnes per annum, pursuant to Clause 12(2) of Schedule 1 of the Protection of the Environment Operations Act 1997.

3.1.7 DPI Biosecurity Strategy 2013-21

'Biosecurity' means protecting the economy, environment and community from the negative impacts of pests, diseases and weeds. Biosecurity is vital for the health, wellbeing and prosperity of everyone in NSW. The NSW Biosecurity Strategy sets the overall direction for the management of animal and plant pests, diseases and weeds in NSW terrestrial and aquatic environments. It is based on the principle that biosecurity is a shared responsibility.

The proposed development is consistent with the aims and objectives of the strategy. The bioenergy facility utilises a proven AD technology that raises the temperature of the entire mass of organic waste over a period of 4 weeks high enough to achieve complete pasteurisation. All digestate produced by the process will be free from pathogens, viable weed seeds and plant propagules.

3.1.8 NSW "Waste Less, Recycle More 2017-2021"

The NSW Government's $337 million extension to the Waste Less, Recycle More program includes $48 million to support the development of new infrastructure for both municipal, commercial and construction and demolition waste materials. A further $35.5 million is allocated to establishment of organics recycling infrastructure. While all funding rounds relevant to the bioenergy facility are currently closed, the development is consistent with the NSW government's demonstrated policy of supporting additional organic recycling infrastructure.

The project aligns with RAMROC regional waste strategy 2017-2021 key point 3.1, 'transition to sustainable systems generating opportunities for growth and improved performance, an approach which views waste as a resource and continually seeks to utilize this resource to their maximum potential'. Similarly, key point 4.4, Holistic approach, states 'a sustainable waste management system, applied holistically, requires initiatives from across all levels of the waste hierarchy to do so'. The installation of the UAG Bio Nutrients facility supports this philosophy.

The NSW Waste Avoidance and Resource Recovery Strategy (WARR) 2014-2021 list as key points 1) avoid and reduce waste generation, 2) Increase recycling, and 4) Manage problem wastes better, and includes a focus on 'Recover the energy – recover the energy from material and feed that back into the economy where this is acceptable to the community'. These are core concepts to UAG Bio Nutrients philosophy and operation.

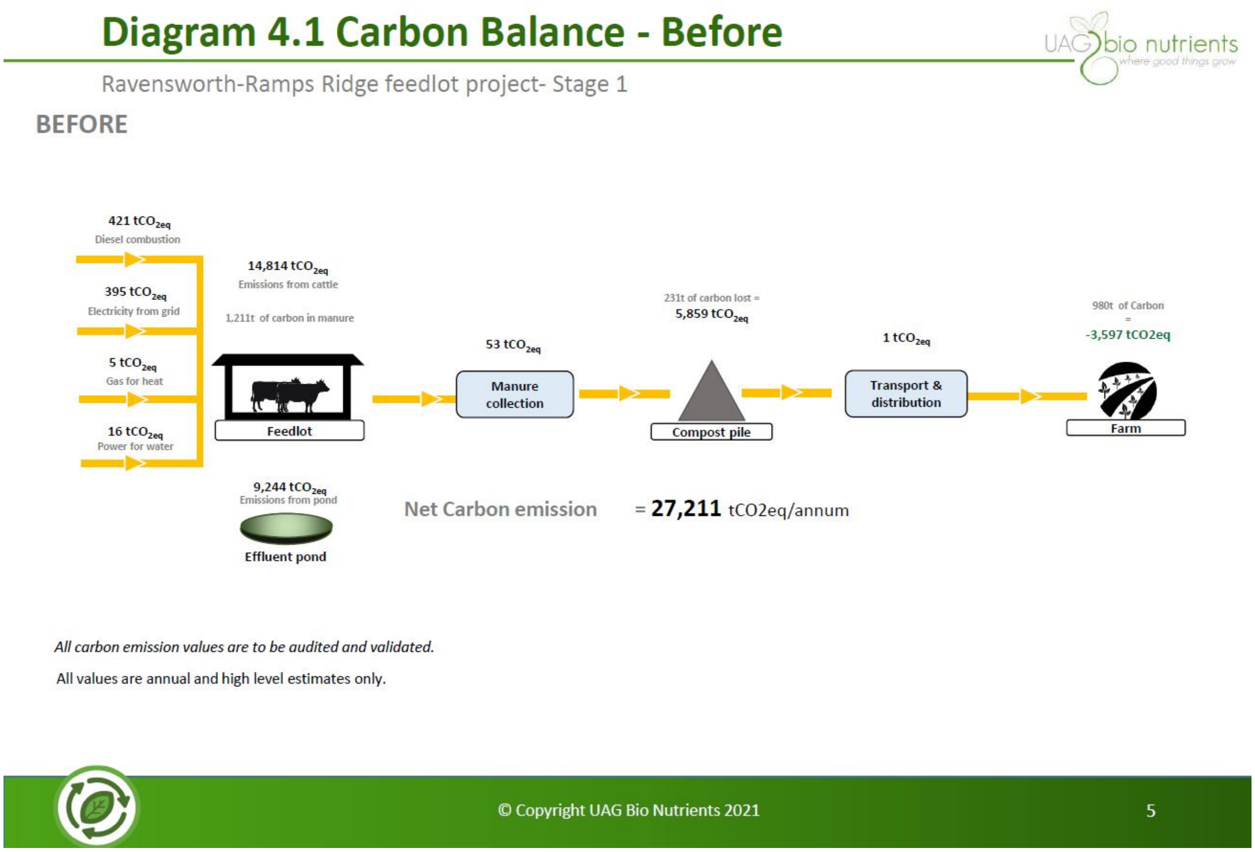
4.0 *Sustainability*

Environmental

The proposed development will consider environmental best practice and sustainability to reduce the impact of the development on the environment. Extensive modelling has identified the following elements as direct positive environmental influences resulting from the UAG Bio Nutrient facility installation.

4.1.1 Carbon

Extensive modelling as shown in Figure 11 shows the direct reduction of greenhouse gas emissions and substantial carbon capture via waste stream conversion equaling **14359$_t$$CO_2$eq/annum**.



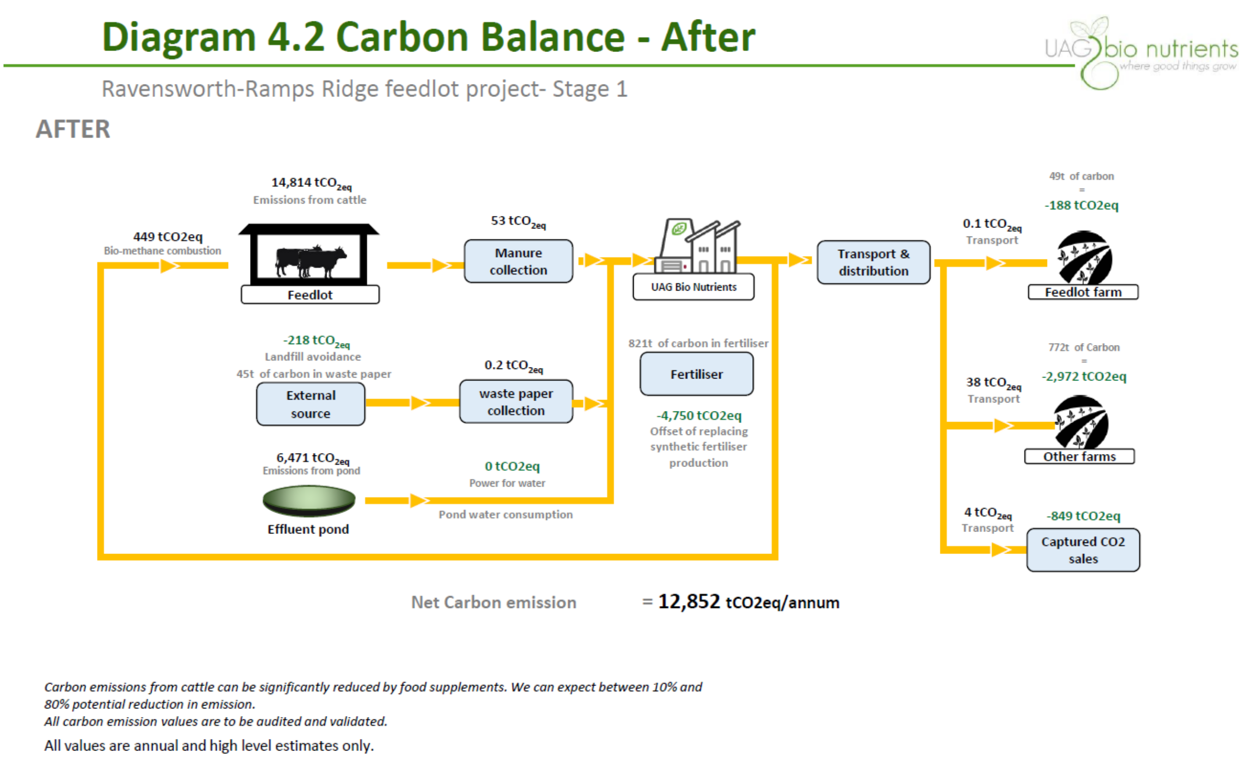


Figure 11: Carbon mass balance modelling for emissions before and after UAG Bio Nutrients facility installation.

4.1.2 Water

Water sensitive design features will be included in the development. All water used for dilution of feedstock before anaerobic digestion will be direct effluent from the feedlot, minimising the use of potable water. Modelling shown in Figure 12 shows the reclamation of 5.2ML of water through the UAG Bio Nutrient facility.

Stormwater runoff from the site will be retained in the existing on-site water storage reservoir, and also retained in rainwater tanks to be directed for use in the office/amenities/laboratory components of the UAG Bio Nutrients facility.

4.1.3 Power

All energy requirements for both the UAG Bio Nutrients facility and the Ravensworth Ramps Ridge facility will be directly supplied through biogas and heat produced onsite, creating 5638MWh energy from feedlot waste streams, as modelled in Figure 13.

2 CHP units will be installed to convert generated biogas into electricity that meets the entire energy needs of the bionutrients facility .

A sealed biogas storage tank and flare will be installed to avoid any biogas emissions to the environment due to failure or maintenance of the CHP

A pressure swing adsorption purification system will be used to improve biogas quality prior to combustion

All aspects of the UAG Bio Nutrients plant will be fully enclosed minimising impacts on air quality, noise and vibration.

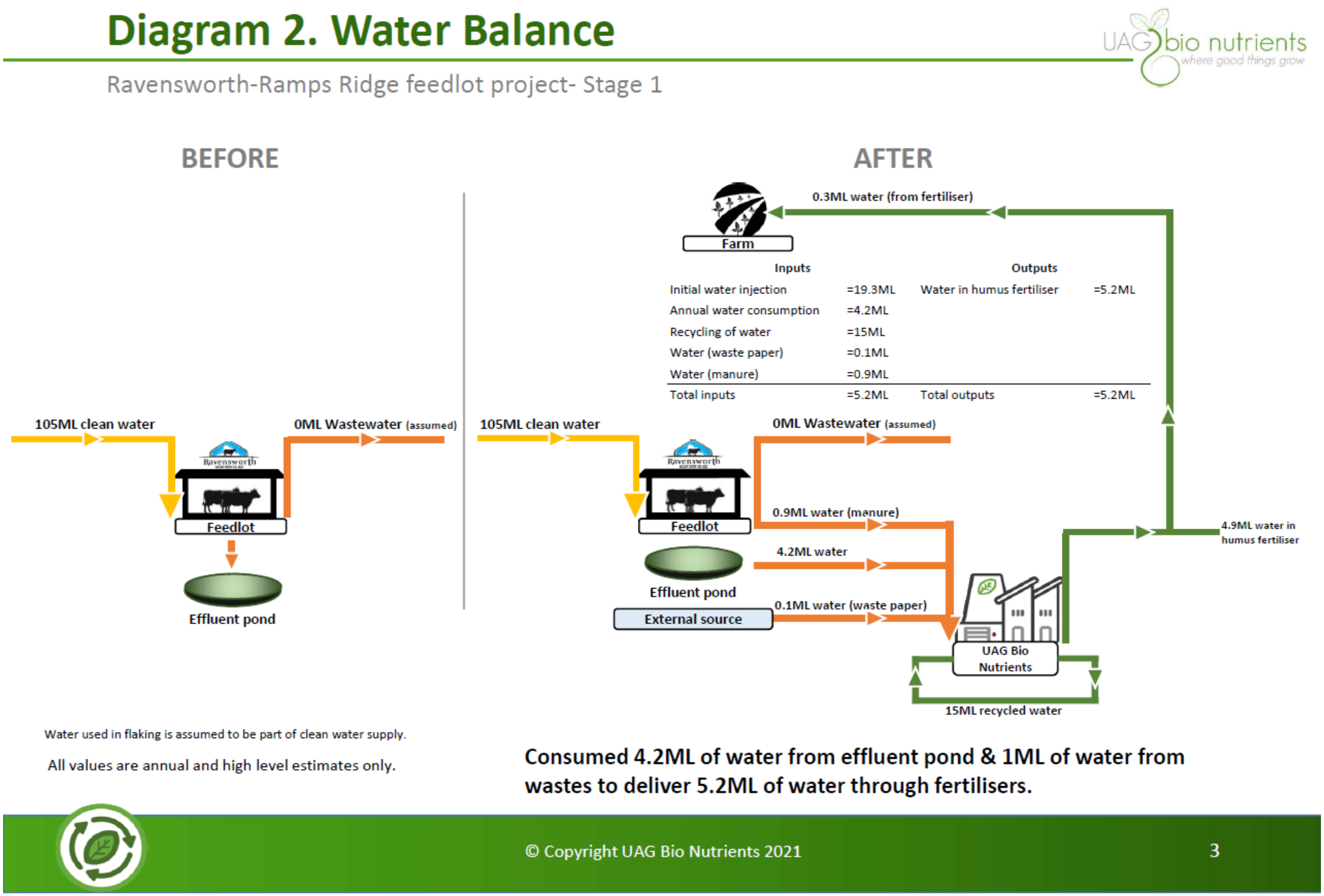


Figure 12: Water mass balance modelling for before and after UAG Bio Nutrients facility installation.

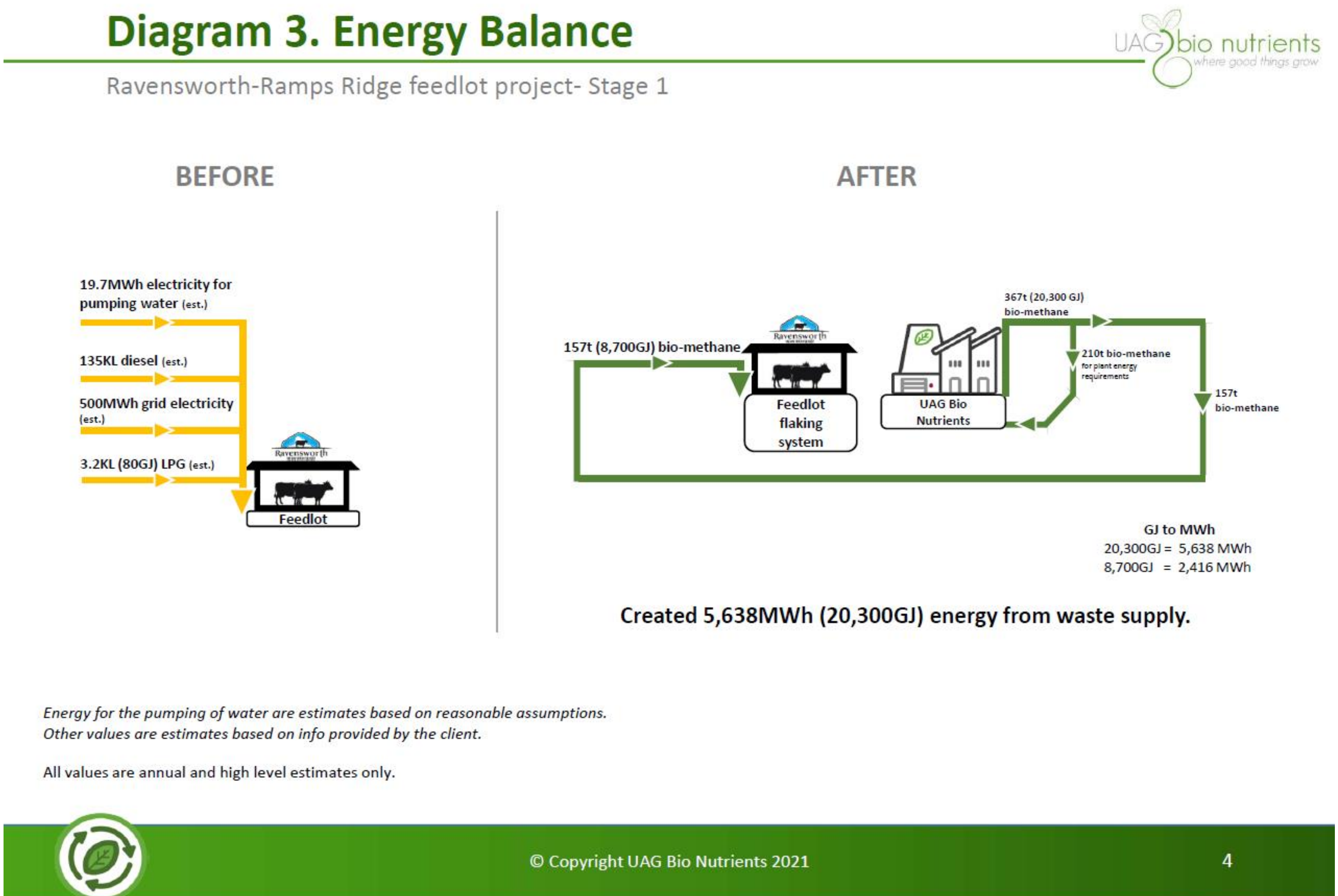


Figure 13: Energy mass balance modelling showing before and after UAG Bio Nutrients facility installation.

4.1.4 Economic Benefits

The installation of the UAG Bio Nutrients facility will represent a significant piece of infrastructure that will assist in creating jobs within the Hay Shire. The project will create 21 jobs in construction over a 12-month period and 4 new full-time jobs during the operational phase. The project will provide Ramps Ridge feedlot with a waste resource recovery facility for the conversion of 4500 tonnes of currently unused waste providing a secure supply of zero emission electrical energy for the feedlot and its operations.

5.0 Engagement

The UAG Bio Nutrients facility is to be located on private property, and is private infrastructure. Engagement between UAG Bio Nutrients and Ravensworth Agricultural Company has been extensive, and Hay council has been consulted in meetings about the development with HoA in place. All supply and off take contract terms have been established and agreed. The Environmental Protection Authority has also been consulted regarding behind farm gate issues with no licensing requirements identified.

6.0 Environmental Impact assessment

The following tables outline the matters, impacts and mitigation measures relevant to the proposed facility. The project risks are divided into the following:

1. Environmental Impacts
2. Design and Engineering Risks
3. Construction risks
4. Operational risks

6.1.1 Environmental Impacts

	Matters	Level of Impact	Risk Mitigation
Amenity	Acoustic	Low	Operations to be fully enclosed limiting noise impacts. Noise levels will not exceed the feedlot current output.
	Visual	Low	Landscaping works to improve visual amenity.
	Odour	Low	Operations to be fully enclosed and biofilter used limiting odour impacts
	Microclimate	None	No microclimate impacts expected
Access	Access to property	None	General access already exists through current internal rd infrastructure
	Access to services	None	No significant impacts. Water will be received from current infrastructure on site. Amenity waste streams to be recycled on site.
	Road network	None	No significant impact on existing rd networks as all traffic is limited to onsite movements
	Parking	Low	Sufficient on site parking to be provided, including visitor parking.
Built Environment	Public domain	None	Project is located on private property
	Public infrastructure	Low	Low impact on road infrastructure
Heritage	High density agricultural site	None	No known impacts on natural heritage. Heritage assessment not required
	Cultural	None	No known impacts on European or other cultural heritage

	Aboriginal cultural	None	No known impacts on Aboriginal cultural heritage.
	Built	None	No impact on heritage listed buildings or infrastructure.
Social	Health	Low	Enclosed operations will minimize impacts on air pollution, water pollution and contamination
	Safety	Low	Fire and emergency procedures to be implemented.
	Community services and facilities	None	No expected impact on community services and facilities.
Economic	Natural resource use	None	No expected impact on minerals, forestry and agricultural resources
	Opportunity cost	None	No expected impacts on customer access to other businesses
Air	Particulate matter	Low	Minimal impacts outside of enclosed operations. Particulate emissions not expected to exceed that of current feedlot.
	Gases	Low	Minimal impacts outside of enclosed operations. Monitoring and mitigation measures to be employed.
	Atmospheric emissions	Low	Some greenhouse gas emission from vehicles. Risk of leakage from sealed biogas systems. Flare to be employed to burn excess gas in case of CHP unit failure.
Biodiversity	Native vegetation	None	Site for the project proposal is currently cleared of all vegetation.
	Native fauna	None	No known threatened or endangered species within lot.
Land	Stability/structure	Low	No known erosion impacts expected.
	Soil chemistry	Low	Soil A horizon is predominantly clay based. No acid sulfate soils present. No known salinity issues
	Land capability	None	No known detrimental impact expected on the capacity of the land
	Topography	None	No excavation required. Site topography is flat.
Water	Water quality	None	Surface runoff will be intercepted and directed to existing water reservoir on site.
	Water availability	None	Water required for AD chambers and preparation tanks is sourced from existing feedlot effluent pond. Water for amenities will be sourced from rainwater tanks.
	Hydrological flows	Low	Limited impacts on natural movement of water across landscape. No riparian corridors associated with site.
Risks	Coastal Hazards	None	No coastal hazards associated with project

	Flood waters	Low	Site is located in a low flood risk zone. Development will be above relevant Flood level AHD.
	Bushfire	None	Site is not located in a bushfire prone zone.
	Undermining	None	No undermining associated with the project
	Steep slopes	None	No steep slopes associated with the project

6.1.2 Design and Engineering Risks

Engineering + Design Risks		
	Risk Analysis	Risk Mitigation
Structural design and integrity	Cell design/structural failure	Independent finite element analysis incorporating commercial safety margins including static & dynamic loadings over 20 years. QA on construction materials.
Intake	Contaminated inputs	The failure of equipment used for physical decontamination of non-organic materials including size, air, water & magnetic separation is mitigated by regular maintenance programs, with appropriate spare parts maintained for rapid repair if necessary. On larger systems, multiple intakes are being used providing system redundancy.
Prep, AD & Post AD tanks	Structural failure	Independent finite element analysis incorporating commercial safety margins including static & dynamic loads over 20 years.
	Digestion failure or stall	When a process stalls it can be re-inoculated rapidly and continue to its completion. Due to the high level of operational redundancy the effect on a system is minimal.
	Leakage	Tank inspection and monitoring to identify any leaks. Each tank can be isolated, drained and repaired. Due to high level of redundancy the effect on a system is minimal.
	Mechanical failure of agitation/heating systems	Agitation, heating and inoculation systems are external and can be isolated, removed and repaired with minimal effect on a tank/process.

		Preventive maintenance program and regular monitoring of tank operational performance.
Bio-N Modules	Malfunction	Control mechanisms to identify individual Bio-N module malfunction. Module can be repaired in situ and placed back to operation. High level operational redundancy means that BioN module failure has minimal impact on the overall system. Manufactured prototypes and tested to scale. Embedded control system to identify malfunction, developed & tested on prototype and ready for commercial production. Remote monitoring & management where required.
	Lack of performance	Vermiculture trials to verify worm density and consumption rates. Fully enclosed environmental control systems in place. Biometric access and entry decontamination to prevent viral/insect contamination of Bio-N systems.
	Failure of feed systems	Bio-N modules and worms they contain can be isolated without food for as much as 7 days. Repairs can be undertaken within that period with minimal to no effect on overall system's performance.
Gas systems	Leakage	Multiple sensors identify leakage of gas and will be alerted as well as actioned automatically to purge through ventilation systems to avoid any risks of explosion. Activated carbon is used in the exhaust system to prevent any toxic gas reaching the atmosphere. Preventive maintenance and monitoring is done for major gas pipes and equipment. Leakage area can be isolated and repaired.
	Mechanical failure	Preventive maintenance program and regular monitoring of gas equipment. In large plants, multiple equipment provides redundancy to the system if there is a malfunction.
	Lack of performance	Designed operational capability at 75% of equipment capacity. It provides further redundancy in the event of failure. Allowance for scheduled downtime for preventive maintenance.
Fertiliser processing systems	Mechanical failure	Preventive maintenance program and regular monitoring of fertiliser processing equipment. In large plants, multiple equipment provides redundancy to the system if there is a malfunction.

	Lack of performance	Designed operational capability at 75% of equipment capacity. It provides further redundancy in the event of failure. Allowance for scheduled downtime for preventive maintenance.
Power & Heat generation systems	Mechanical failure	Preventive maintenance program and regular monitoring of power & heat generation equipment. In peak generation scenario, multiple power and heat generation lines provides built in redundancy to the system if there is a malfunction. If there is no peak generation requirement, extra equipment will be added for operational redundancy.
	Leakage	Control systems monitor heating & cooling pipeline systems to identify leakage. The systems can be isolated, drained and repaired.
Gas storage systems	Leakage	Multiple sensors detect any gas leakage, raising alerts as well as automatically purging through ventilation systems to avoid any risks of explosion. Activated carbon is used in the exhaust system to prevent any toxic gas reaching the atmosphere. Preventive maintenance and monitoring is done for major gas pipes and equipment. Gas storage is kept away from the main facility in a secure way to avoid a hazardous environment.
	Excessive pressure	In built safety valves & sensors on storage devices for alerting as well as automatically venting.
Scaling of facilities	AD process unable to scale from small to large tanks	Conducted laboratory tests on 15L, then 1000L, followed by 1800 L tanks to assure the scalability of the process. Comparison of test results from internal and external (EAL) laboratories to validate. Tank efficiencies improve with larger scale.
	Bio-N process unable to scale from small to large modules	Tests have been conducted on 3 versions of Bio-N module confirming reliability and performance, with independent testing of humus fertiliser output.
	Gas handling & power generation scale	Off the shelf equipment is used. They have high levels of reliability and performance.

6.1.3 Construction Risks

Construction Risk		
	Risk Analysis	Risk Mitigation
Structural Cells	Unavailability of material	Approved supplier program to include reliable and consistent suppliers (under development). Coordination of deliveries ahead of construction schedule to account for delays in transportation & shipping.
	Low quality material / different material	Approved supplier program to include reliable and consistent suppliers (under development). Pre-despatch test reports. Onsite quality control measures including inspections & tests.
	Assembly / fabrication error	Construction crew undergoes onsite training and is provided with clear documentation of construction procedures. Structural cell parts are designed in a 'fool proof' way so that they will align with the correct assembly. Also most of the parts are standardised, so there isn't little or no interchangeability.
	Lifting failure	Independent finite element analysis has been completed to evaluate the stability of lifting mechanisms as well as lifting method. Safe procedure is in use and follows workplace safety guidelines during the lifting process.
Prep, AD and Post AD tanks	Tank manufacturing line failure	Before the tank manufacturing machinery is shipped to Australia, it will be commissioned and tested on site with independent verification, producing full scale tanks as well as some smaller sized tanks. The smaller scale tanks will be shipped to UAG's Alstonville facility for larger scale facility construction, commissioning and testing. This ensures the operability of tank production line. The tank manufacturing equipment supplier is contracted to provide onsite training in Australia. On operation, if any part failure occurs, enough spares for major parts will be kept to avoid prolonged break down. Online video conference support is also available from the supplier, if necessary. Preventive maintenance and monitoring will be in place.

	Tank manufacturing delay	The tank manufacturing line is containerised to facilitate transport to each site. The containers are fabricated to ensure on-site alignment for manufacturing once connected.
	Manufactured tank out of required specifications	The construction crew undergoes onsite training under the direction of UAG Bio Nutrients engineers. All fabrication and manufacturing processes are documented. HDPE Material inspection at arrival with test reports. Tank pressure test post fabrication. If a tank is rejected, the plastic material will be recycled onsite.
Bio-N modules	Bio-N out of specifications	Construction crew undergoes on-site training under the direction of UAG Bio Nutrients engineers. Assembly and commissioning manuals are provided. Pictorial step by step assembly procedure will guide the fabrication. Moulded parts inspection at arrival and test report. Belt inspections before shipment and on-site.
	Assembly / fabrication error	Prototypes has been developed using 3D printing to evaluate the physical assembly process. Assembly and commissioning manuals are provided. Pictorial step by step assembly procedure will guide the fabrication. No. of parts per assembly are kept as low as possible to avoid error.
	Control related problems	The control system is developed and tested on Bio-N modules at test facility. Wireless communications are in place to control any device as well as alter the control program itself using remote communications.
Gas systems, gas storage, fertiliser processing systems & Power generation	Equipment malfunction	Off the shelf equipment are used, with high levels of reliability and performance. If not working, item will be returned and replaced. Test reports are required before delivery.
Skills and labour	Lack of skill	Construction crew undergoes on-site training and is provided with clear documentation of construction procedures. This equips each crew member with required skills for a particular operation. The modular structural cell based construction requires less building skills. The highest on site skill includes fabrication using nuts& bolts, plastic welding and electrical wiring.
	Lack of labour	UAG is looking at in house and outsourcing construction teams. The commissioning teams will be 'in house'.

		Automation is considered wherever possible to make assembly and construction process less labour intensive –eg. robotic welding of tank endcaps
Geopolitical	Source of raw materials	Structural and fabricated steel has been sourced from 3 different countries. Currently working with a Chinese supplier. The AD manufacturing line will be used on site in Australia, limiting the geopolitical risk to larger sites requiring extra AD tank manufacturing equipment. Note that the Bio-N plastic injection moulds can be used for manufacturing parts in Australia and in a variety of countries.

6.1.4 Operational Risks

Operational Risk		
	Risk Analysis	Risk Mitigation
Intake / Decontamination	Not being able to source sufficient quantity of raw organic waste, and seasonal intake variability	The current project focus is in regional Australia, where there is access to extensive crop, food and garden waste, plus feedlot, poultry and meat processing waste, as well as bio-solids. At present major cities and regional centres have extensive waste problems, with large quantities of waste sent to landfill. Where the logistics make sense against gate fees, this organic waste can be shipped to regional facilities. UAG can use different types of waste inputs to create a feasible balanced mix of input for digestion process and thus not relying on single type of input material. Seasonality is also addressed by the in-built redundancy in each facility, allowing continuous processing with varying throughput.
	Contaminated inputs	Approved supplier program including audit under ISO standards (under development). Input inspection – physical. Chemical contaminants are addressed by laboratory prior to entry. Where contamination does contaminate a prep tank, the tank is isolated and corrected accordingly for decontamination.

		Physical decontamination of non-organic materials including size, air, water & magnetic separation. Where necessary human belt sorting will be used in addition to the automated decontamination.
Prep, AD & Post AD tanks / Anaerobic Digestion	Digestion failure or stall	When a process stalls it can be re-inoculated rapidly and continue to its completion. Due to high levels of redundancy the effect on a system is minimal.
	Leakage	Tank inspection and monitoring to identify leaks. Each tank can be isolated, drained and repaired. Due to high level of redundancy the effect on a system is minimal.
	Mechanical failure of agitation/heating systems	Agitation, heating and inoculation systems are external and can be isolated, removed and repaired with minimal effect on a tank/process. Preventive maintenance program and regular monitoring of tank operational status.
Bio-N Modules / Vermiculture	Contamination	The BioN modules operate in an enclosed controlled environment to avoid insect and rodent infestation.
	Malfunction	Control mechanisms to identify individual Bio-N module malfunction. A module can be repaired in situ and placed back to operation. High level operational redundancy means minimal effect on overall system. Manufactured prototypes produced, operating and tested to scale. Embedded control system to identify malfunction, developed & tested on prototype and ready for commercial production. Remote monitoring & management where required.
	Lack of performance	Vermiculture trials to verify worm density and consumption rates. Fully enclosed environmental control systems in place. Biometric access and entry decontamination to prevent viral/insect contamination of Bio-N systems.
	Failure of feed systems	Bio-N modules and worms they contain can be isolated without food for as much as 7 days. Repairs can be undertaken within that period with minimal to no effect on overall system performance.
	Worm death	The ideal operating temperature for the targeted worms is between 22^{0}C and 25^{0}C. BioN modules are placed in a temperature moderated environment. All environmental conditions are monitored and reported. Emergency conditions will be alerted for rapid response, locally and remotely. Breeding programs will be in place to repopulate modules promptly, where necessary.

	Accidental or deliberate poisoning of the vermiculture modules	The targeted worms are a resilient organism, highly tolerant to most contaminants. The enzyme reactions in the worm's stomachs, destroys most pathogen, virus and poisons.
	Contamination by E Coli, salmonella, other pathogens and viruses.	Research to date, from various research bodies, government and individuals, indicates substantial reduction (or no detection) of pathogens and viruses post inoculation. Kill rates have been recorded at log 6 and higher. Laboratory and test facility results confirm the research. Note that all joint venture facilities have on site testing laboratories.
Gas systems	Leakage	Multiple sensors identify leakage of gas and will be alerted as well as actioned automatically to purge through ventilation systems to avoid any risks of explosion. Activated carbon is used in the exhaust system to prevent any toxic gas reaching the atmosphere. Preventive maintenance and monitoring is done for major gas pipes and equipment. Leakage area can be isolated and repaired.
	Mechanical failure	Preventive maintenance program and regular monitoring of gas equipment. In large plants, multiple equipment provides redundancy to the system if there is a malfunction.
	Lack of performance	Designed operational capability at 75% of equipment capacity. It provides further redundancy in the event of failure and allows for scheduled downtime for preventive maintenance.
Fertiliser processing systems	Mechanical failure	Preventive maintenance program and regular monitoring of fertiliser processing equipment. In large plants, multiple equipment provides redundancy to the system if there is a malfunction.
	Lack of performance	Designed operational capability at 75% of equipment capacity. It provides further redundancy in the event of failure and allows for scheduled downtime for preventive maintenance.
Power & Heat generation systems	Mechanical failure	Preventive maintenance program and regular monitoring of power & heat generation equipment. In peak generation scenario, multiple equipment provides built in redundancy to the system if there is a malfunction. If there is no peak generation, extra equipment needs to be added for redundancy.
	Leakage	Control system includes heating & cooling pipeline inspection and monitoring to identify leaks.

		They can be isolated, drained and repaired.
Gas storage systems	Leakage	Multiple sensors identify leakage of gas and will be alerted as well as actioned automatically to purge through ventilation systems to avoid any risks of explosion. Activated carbon is used in the exhaust system to prevent any toxic gas reaching the atmosphere. Preventive maintenance and monitoring is done for major gas pipes and equipment. Gas storage is kept away from main facility in a secure way to avoid hazardous environment.
	Excessive pressure	In built safety valves & sensors on storage devices for alerting as well as automatically venting.

7.0 Evaluation and Conclusion

This environmental impact statement has been prepared for the proposed construction and operation of a UAG Bio Nutrients plant on the Ravensworth Ramps Ridge feedlot at Maude in the Hay Shire Council region, commissioned by UAG Bio Nutrients. The study found that the site is well situated to allow waste streams from the feedlot to be converted to net positive electricity supply for both the UAG biogas plant and the Ramps Ridge feedlot operations. Installation also facilitates the production of large volumes of high quality BioH70 biohumus fertiliser to enhance and optimize inputs into agricultural systems to achieve improved yield, quality and sustainability across a broad spectrum of parameters.

Extensive modelling has shown the proposed biogas facility can reduce emissions from the feedlots current operations by $14359_{t}CO_2$ eq/annum, providing significant contribution to the Federal Government's 2050 net zero emissions target, supporting the delivery of the Australian red meat industry's target of achieving carbon neutrality by 2030, and assisting Ravensworth Agricultural Company towards its carbon neutral beef production targets. Consistent with UAG Bio Nutrients philosophy, the project will provide a pathway for regional agricultural industry to gravitate to circular economies and improve, protect and nurture Australian soils and agricultural production.

Evaluation of environmental risks has shown minimal to no impact on the immediate environment and location of the facility. The reuse of effluent water and current waste streams for the production of biogas and green energy enables highly efficient and environmentally conscious design supported by extensive modelling which shows highly significant positive impacts to the environment. Thorough risk assessment and mitigation measures have been identified for implementation.

Legislation shows that the proposal is not classed as a Designated Development under the Environmental Planning and Assessment Regulation 2000, and as such does not require EPA licensing, and is not subject to SEARS assessment prior to environmental impact statement preparation. Capital Investment Value for the project is approximately $15 million and as such the project is classed as Regionally Significant Development under the State Environmental Planning Policy (State and Regional Development) 2011. Application will therefore need assessment through the Western Regional Planning Panel consent authority.