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Skala Australasia Pty Ltd
Byron Bioenergy Facility
Response to Submissions Report

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Executive Summary

Byron Shire Council (BSC) is seeking development consent for a resource recovery facility (anaerobic digestion and composting) and associated electricity generation works located at 45 Wallum Place, Byron Bay.

BSC proposes to construct and operate a best practice Bioenergy Facility (BEF) that can receive and process up to 28,000 tonnes per year of organic wastes from local communities and biosolids from the Byron Bay Sewage Treatment Plant (BBSTP). During operation, the BEF will capture biogas (the result of organic waste processing) and generate sustainable energy for use at the BBSTP, the BEF itself and for grid export. It will also produce various soil amendments suitable for use in landscaping and agricultural production.

The proposed BEF is in Byron Shire on the Far North Coast of New South Wales, about 800 kilometres north of the Sydney CBD and 200 kilometres south of the Brisbane CBD. The BEF will be located on the southern side of Wallum Place, Byron Bay, to the west of Bayshore Drive and adjacent to the existing infrastructure of the BBSTP, which is owned and operated by BSC. The main BEF site comprises a small portion of the 104 ha contained in Lot 2, DP 706286.

The proposed Byron Bioenergy Facility (BEF) will provide local processing capacity for the organic wastes already being source separated by the community, while making additional capacity available for the diversion of more waste from landfill as the population and economic activity in the area grows. It will also provide a secure supply of zero emission electrical energy that will meet the entire electrical energy demands of the BBSTP and export additional electricity to the grid.

By installing a long term, reliable, locally based organics recycling solution, the intention is for this facility to result in the Byron Community reducing their waste management costs and their impact on the environment. The proposed BEF will produce composted soil amendments locally. The nutrient value and quality of these soil amendments will exceed those produced at BSC's existing garden waste composting facility and will deliver significant soil health benefits to nearby agricultural lands and local residents.

Under Section 4.10 of the Environmental Planning and Assessment Act 1979 the proposed development is a Designated Development, requiring an EIS to be submitted with the development application.

The original development application was submitted to Byron Shire Council on 6th July 2021. The proposal was on public exhibition from 14th July 2021 to 10th August 2021. Public exhibition was then extended until 24th August 2021. Comments from NSW government agencies on the development application and EIS were received from 14th July 2021 to 25th October 2021.

This report is a response to the submissions received and addresses the comments in those submissions to allow for a final determination of the proposal.

During exhibition, a total of 71 general public submissions were received during the public exhibition period, including 10 from organisations and 61 from individuals. In addition, submissions were received from a total of 5 government agencies.

In response to the comments received from government agencies, organisations and the general public, a number of the technical studies were reviewed, some were revised, and responses to the comments prepared. These include:

- Site layout (architectural) plans;
- Biodiversity Development Assessment Report;
- Koala Habitat Assessment Report;
- Soil and Water Management Plans; and
- Acid Sulfate Soil Management Plan.

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The updated technical studies have comprehensively addressed peer review comments that were submitted by some members of the community as part of the public exhibition process. In response to the public and agency comments, refinements to the design and operation of the development are proposed. These are described in this report.

Mitigation measures proposed in addition to those listed in the submitted EIS are summarised as follows:

- Speed limits will be enforced and signage will be erected to warn vehicle operators of wildlife. Speed limits for trucks will include the following:
  - 40Km/hr on Wallum Place;
  - 20km/hr on STP internal access road; and
  - 10km/hr in truck turning area and receival hall;
- The access road will be relocated to the existing entrance north of the STP buildings and via upgrade to the existing internal STP access roads;
- Part of the fencing installed near the BEF will incorporate local provenance native flora species (i.e. native vines) to reduce aesthetic impacts of the BEF and promote habitat for birds, frogs and Mitchells Rainforest Snail;
- Lighting will be turned-off at night when the site is not occupied. Vehicle noise will be managed by enforcing slow speed limits, avoiding break noise, and ensuring the tipping of materials occurs in an enclosed area (in-doors);
- If BSC is notified of any threatened bird species breeding activity near the development site (e.g. Comb-crested Jacana at H-cell), BSC will engage a suitably qualified person to advise the best course of action to reduce potential for indirect impacts;
- In lieu of biodiversity offset credits, Council will fund biodiversity conservation actions in the constructed wetlands that form part of the BBSTP sewage treatment works, and in consultation with local environmental groups;
- An acid sulfate soil (ASS) treatment pad size and location, including retention on site of a 100-year storm event, is now noted in the updated construction soil and water management plan (CSWMP) prepared by MPC (Appendix F);
- An updated Acid sulphate Soil Management Plan (ASSMP) (Appendix G) provides details of the treatment methodology. Any contaminated water found during construction will be captured and retained on-site, pumped out and disposed of to a suitably licensed facility;
- No light or heavy vehicle movements relating to the BEF will occur prior 7 am or after 5pm except those relating to urgent responses to equipment breakdown;
- The following community noise mitigation will also be implemented:
  - Noise mitigation measures will be discussed on-site with construction workers over pre-start toolbox;
  - Prior to and during construction, outreach to potentially impacted residents will be undertaken to clearly explain the forecast duration of the planned works;
  - If there are complaints concerning noise once construction has started, the potential issue will be discussed with the foreman and plant operators, the source of the potentially offending noise identified, and other reasonable and feasible options for mitigation identified and implemented (e.g., potential respite or alternating/modified equipment usage);
  - A copy of the complaints register will be kept on site;
- In the highly unlikely event that odour emissions become persistently problematic, we will:
  - Contemplate installing an industrial air curtain on receival hall doors;
  - Increase the number of air changes per hour in the receival hall; and
  - If the increased airflow through the biofilter causes odour issues we will implement the biofilter contingency measures already proposed in Table 6.5 of the EIS.

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All technical studies conclude that the final design will result in the facility having minimal impact on the environment and surrounding land users. Overall, the project meets the environmental criteria in the relevant standards and guidelines.

The environmental and social impact on the local area will be negligible. The project is consistent with the objectives of the land use zoning and with the Council development strategies for the area. The new facility will provide employment, economic benefits and best practice organics resource recovery services for the region, a national reference site for the replication of other much-needed similar facilities in Australia, and is recommended for approval.

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1. Introduction

An Environmental Impact Statement (EIS) has been prepared on behalf of Byron Shire Council (BSC) to support the Development Application (DA) for a resource recovery facility (anaerobic digestion and composting) and associated electricity generation works at 45 Wallum Place, Byron Bay (Lot 2 DP 706286). For a number of important reasons, the bioenergy facility is proposed for co-locating on the grounds of the Byron Bay Sewage Treatment Plant (BBSTP).

Bioenergy production is attractive to BSC and its residents because it reduces organic waste disposed to landfill while using biogas derived from waste in place of fossil fuels to generate electricity. It therefore reduces greenhouse gas emissions from landfilling and from energy use, thus making a significant contribution towards local and state government net zero emissions targets.

The main site of the proposed development comprises a small portion of the land contained in Lot 2, DP 706286. While large portions of the lot are undeveloped, the selected site has previously been cleared and currently forms part of the landscaped grounds inside the fence line of the BBSTP.

The subject land is zoned (RU2) Rural Landscape and (DM) Deferred Matter under the *Byron Local Environmental Plan 2014* (Byron LEP). For DM zoned areas the *Byron Local Environmental Plan* 1988 applies. The DM land is zoned (5a) Special Uses, which is equivalent to (SP2) Infrastructure zoning.

The Byron LEP does not specifically permit use of the land for the proposed Byron BEF. However, the *State Environmental Planning Policy (Infrastructure)* 2007 overrides the Byron LEP and therefore the proposed Byron BEF is permitted with consent.

BSC is committed to complying with all laws that affect its operations and understands that development approval and appropriate licensing is required prior to the proposed development occurring. As a designated development project, Clause 4.12(8) of the *Environmental Planning and Assessment Act* 1979 applies, and an Environmental Impact Statement (EIS) in the form prescribed by the Regulations was required to be prepared to accompany the development application.

1.1. Status of development approval

A development application, with EIS, was submitted to Byron Shire Council on 6th July 2021. The proposal was on public exhibition from 14th July 2021 to 10th August 2021. Comments from NSW government agencies on the development application and EIS were received from 14th July 2021 to 25h October 2021.

This Response to Submissions (RTS) report provides further explanation of the proposed development, responds to the submissions received, and addresses the comments in those submissions.

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2. Overview of the exhibited project

2.1. Summary of project description in exhibited EIS

The proposed development will involve the construction and operation of a best practice Bioenergy Facility (BEF) receiving organic waste materials from households and businesses in the Byron Shire and neighbouring local government areas. The facility will be enclosed and operate under negative pressure to ensure all emissions from the process are treated before release. Biogas will be collected and consumed onsite to generate electricity. No biogas will be exported from the site.

A site plan providing an overview of the proposed development and operations is given in Figure 1. Key operational features of the development within the approximately 4,000 m^2 footprint includes:

- A Receival Hall;
- Four Anaerobic Digestion Tunnels with gas storage;
- Three Aerobic Composting Tunnels
- A Biofilter;
- A Percolate Storage Tank with sand filter;
- A Combined Heat and Power (CHP) unit with gas treatment and flare;
- Office and education facilities; and
- A car park to assist in traffic flow on the site.

An additional approximately 4,000 m^2 is occupied by the truck circulation area, access roads, and a weighbridge. The existing STP biosolids storage area will be repurposed to store products from the BEF.

The proposed dry Anaerobic Digestion (AD) technology for the BEF is a BEKON dry fermentation batch process that transforms solid organic waste into organic digestate while producing biogas which can be turned into electricity and heat. Four AD tunnels and three aerobic composting tunnels are required to process up to 28,000 tonnes/year of organic waste. While the waste material is processed inside the AD tunnel for approximately three weeks, biogas is produced and brought to the combined heat and power unit (CHP) via a gas storage facility. The latter serves to even out the biogas quality and bridge maintenance works at the CHP. Before the biogas enters the CHP, it is cooled, compressed, and run through an activated carbon filter if required.

After approximately 3 weeks have passed, the tunnel is purged with exhaust gas from the CHP to displace any remaining biogas in the tunnel. Once there is virtually no biogas left, the tunnel door is opened and the digestate will be taken out of the tunnel by front loader and temporarily stored in the Receival Hall. Any residual gas escaping into the Receival Hall will be collected for treatment through the biofilter.

The digestate will be further stabilised using 3 weeks of aerobic composting in tunnels followed by screening. Upon discharge from the screen, the product will be transferred by tipper truck to a covered storage area located within the adjacent STP for storage and later dispatch for sale. Up to 2 weeks of compost production (600 tonnes) may be stored in the Receival Hall. A minimum of 2 weeks product storage (600 tonnes or 1,000 m^3) will also be available in the covered storage area at the adjacent BB STP.

The BEKON Dry Fermentation Process is designed to reduce liquid excess as much as possible. Nevertheless, during the process, it is possible that some surplus liquid (percolate) will be generated. Using percolate to inoculate each newly filled tunnel is likely to enable a neutral water balance for the facility. Surplus percolate can be recycled within the AD process. The BEF can store percolate excess for up to six months, allowing for infrequent disposal at a licenced facility and at the most opportune time, in the unlikely event that this is required.

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Electricity generated by the BEF will be utilised to power the BBSTP and the BEF itself, thereby offsetting electricity costs for the plant. Surplus electricity generated will be exported to the grid and sold. The proposed capacity of the CHP is 450 kW. When processing 28,000 tonnes/year, it will produce approximately 3,000 MWh/year of electricity energy in addition to a small amount of surplus heat energy. The operation of the BEF will use 1,000 MWh/year of the electrical energy generated.

The general layout of the exhibited project is provided in Figure 2.1. The exhibited project layout for the receival hall, tunnels, office and associated plant and equipment is provided in Figure 2.2. A process flowchart for the operation of the receival area is provided in Figure 2.3.

2.1.1. Construction summary

The construction phase will occur over approximately 10 months and can be divided into 6 stages detailed below. Prior to the commencement of works on-site a complete services search including a Dial Before You Dig (DBYD) search will be undertaken to identify any services which could be affected by the construction works. Construction works will include:

- Site mobilization;
- Ancillary and enabling works;
- Excavation & Civil works;
- New building works;
- Pavement works; and
- External and miscellaneous works.

Services for the construction phase will be supplied as follows:

An average of 6-8 truck movements per day (including all deliveries of equipment and materials) are expected during construction of the proposed facility. These movements will primarily be related to delivery of materials and movements on-site for a short-term period. Some light vehicles for construction workers travelling to and from the Site are also expected.

The construction works would be undertaken in accordance with the Interim Construction Noise Guideline (DECCW 2009) and would typically occur during the standard working hours between:

- 0700 to 1800 hrs Monday to Friday; and
- 0800 to 1300 hrs on Saturdays.

There will be no construction works on Sundays or public holidays.

2.1.2. Operational summary

The anaerobic digestion tunnels and the composting tunnels including associated plant (fans and pumps) will be functioning 24 hours per day and 7 days per week.

However, the facility will be staffed 6 days per week between the hours of 7am to 5pm Monday through Friday and 8am to 1pm on Saturday, as summarised in Table 2.1. Five full-time equivalent staff will be required to operate the facility (when operating at capacity) during these times. Activities during this timeframe will include waste receival and dispatch, unloading and loading of the tunnels, decontamination, screening and related activities.

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Table 2.1. Existing and Proposed Operational Hours.

Operational	Staff Hours / Deliveries	Tunnel Operation
Monday - Friday	7am - 5pm	24 hours / 7 days per week
Saturday	8am – 1pm	
Sunday or public holidays	No times / NA	

Access to the facility during operational staff hours will be through a secure gate. The facility will include a securely fenced perimeter with no access for the general public. No unplanned drop-off of materials will be accepted from the general public. Any pre-arranged access to the facility by the public will be controlled by facility staff through the secure gate.

There will be a small facility attached to the office area to host small community group or school workshops that are planned in advance.

A weighbridge will be located near the entrance to the BEF. Trucks entering from Wallum Place via the site access road will register weight on the entry weighbridge. If truck weights are unknown, weight will be registered upon exit.

Operational plant and equipment include the following:

- Receival Hall
- Digestion Tunnels
- Biogas Storage
- Technical Walkway
- Pump Room
- Combined Heat and Power Unit
- Gas Flare
- Administration Building
- Operational Plant (e.g., Front End Loader, Picking Machine, Shredder, Screen)

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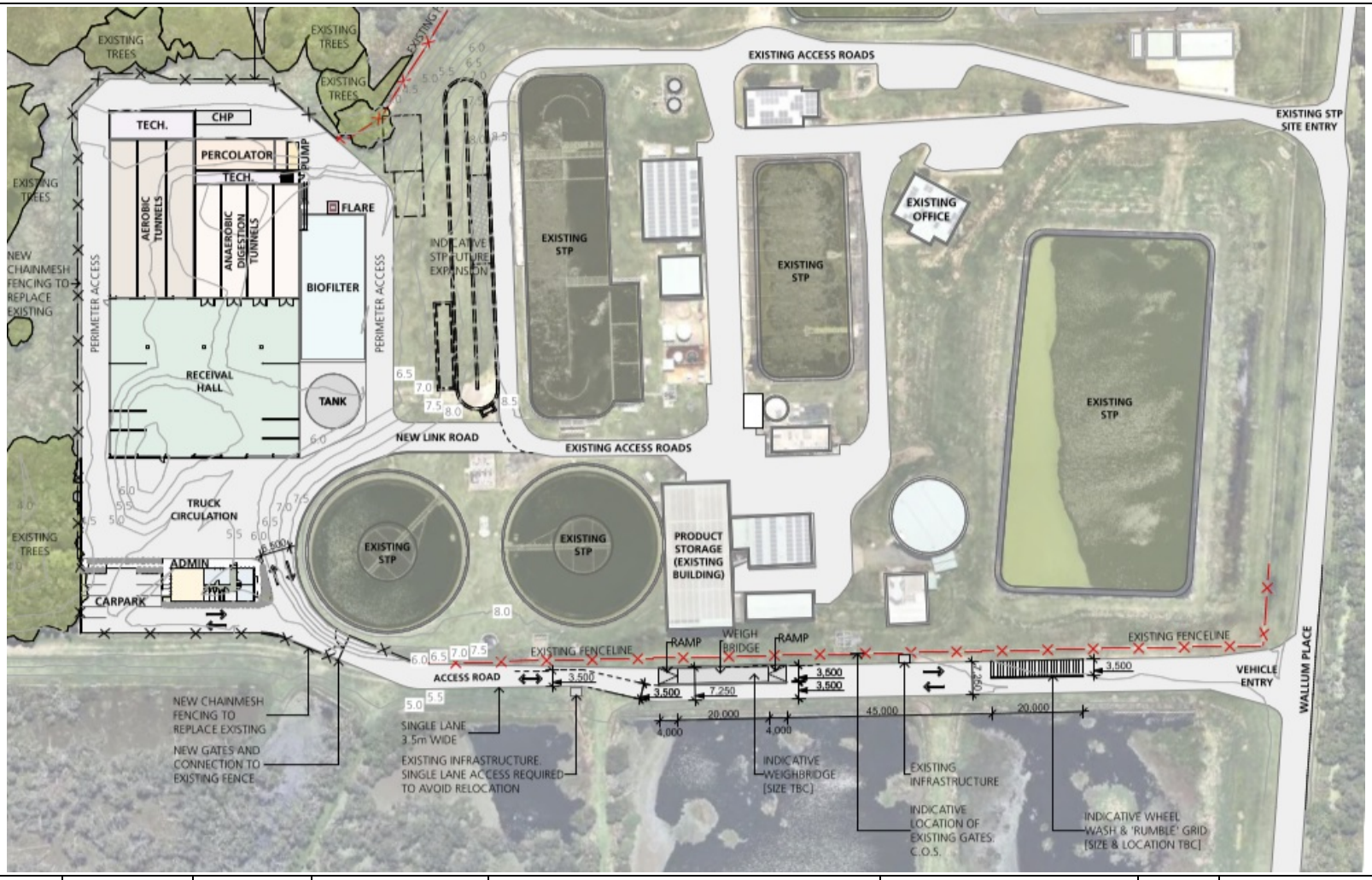
Figure 2.1. General layout of the BEF – as exhibited.



Date	Revision	Drawn By	Site description	Jackson Environment and Planning Pty Ltd		Client	Byron Shire Council
10/05/21	Revision A	E. Larson	45 Wallum Place, Byron Bay	Strategy | Infrastructure | Compliance | Procurement A: Suite 102, Level 1, 25-29 Berry St, North Sydney NSW 2060 E: admin@jacksonenvironment.com.au T: 02 8056 1849 W: http://www.jacksonenvironment.com.au	JACKSON ENVIRONMENT AND PLANNING STRATEGY | INFRASTRUCTURE | COMPLIANCE | PROCUREMENT	Project	Byron Bioenergy Facility
28/06/21	Revision B	A. Johnston				Title	Site Plan Byron BEF
						Scale	Not to scale
						Source	SHAC

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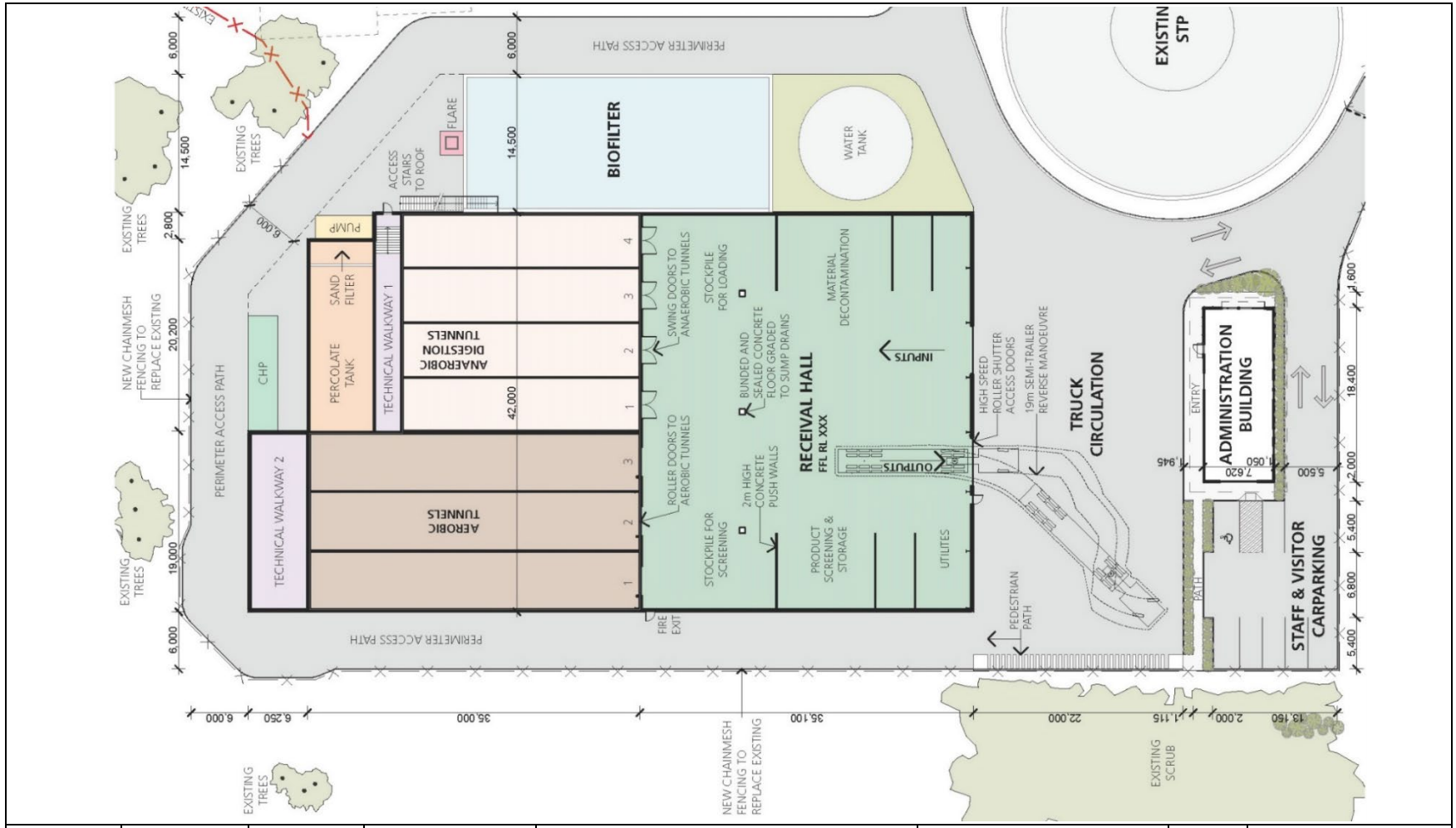
Figure 2.2. Layout of the Receival Hall, Tunnels, Office and Associated Plant and Equipment – as exhibited.



Date	Revision	Drawn By	Site description
10/05/21	Revision A	E. Larson	45 Wallum Place, Byron Bay

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Client	Byron Shire Council
Project	Byron Bioenergy Facility
Title	Site Plan Byron BEF Main Area
Scale	Not to scale
Source	SHAC

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Figure 2.3. Process flow chart for the operation of the Receival Area – as exhibited.

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2.2. Summary of key issues identified in exhibited EIS

The sections below summarises the concerns raised during the public exhibition period. The following discussion relates to the project as proposed. However, considerable effort has been made in the interim to address these concerns.

2.2.1. Biodiversity issues in exhibited EIS

The initial development design required the clearing of small patches of native vegetation within the lot. However, the design submitted with the EIS was altered to avoid clearing this vegetation. The retention and protection of all trees surrounding the proposed BEF site was confirmed by an experienced, qualified Consulting Arborist. As a result, and as provided in the Biodiversity Development Assessment Report (BDAR) accompanying the EIS, the development will only require the clearing of 0.52 hectares of non-native vegetation. No clearing of trees is required.

Mitchells Rainforest Snail is the only endangered species that occurs within the development footprint, with an additional four vulnerable species predicted to occur. An assessment of whether the proposed impacts on these species are serious and irreversible was undertaken as part of the EIS. No threatened ecological communities occur within the development footprint. The BDAR determined there will be no loss of any extent of threatened ecological community because of the proposed development.

The BDAR also determined that it was unlikely there would be any appreciable indirect impacts on biodiversity arising from the proposal that have not been addressed in this EIS. This takes into consideration the nature and scale of the proposed development in conjunction with the proposed impact mitigation measures, and also in relation to the character of the study area, the historic disturbance and fragmentation, and maintenance of vegetation within the property. The proposed development does not trigger the Biodiversity Offset Scheme (BOS) as it does not involve clearing of native vegetation from any area mapped 'Biodiversity Values' further, the development does not exceed the 'vegetation area clearing threshold'. The development will not cause a significant impact to any threatened species or ecological community.

A letter from the NSW DPIE Biodiversity and Conservation Department (dated 20 October 2021) confirmed that as impacts from the proposed BEF are unlikely to significantly affect threatened species, ecological communities or their habitats, the BOS is not triggered. Therefore, Council can opt-in to producing a BDAR but is not required to retire biodiversity offset credits to offset any residual impacts, as there is no legislative mechanism that enables such. Instead, Council has opted to mitigate impacts on site, and offset residual impacts through direct biodiversity actions on site. This includes the installation of designated 'nesting poles' suitable for threatened raptors and waterbirds. Further details on what Council is planning to do to enhance biodiversity values via the proposed BEF is provided in Table 8.1 of this RST report.

To provide legal certainty that the impacts on the Mitchells Rainforest Snail will not be considered significant under the *Environment Protection and Biodiversity Conservation Act (*EPBC Act) 1999, BSC submitted a referral to the Commonwealth Department of Agriculture, Water and the Environment on 7 June 2021. A decision was provided on 27 July 2021 that the proposed development is not a controlled action, and not likely to incur a significant impact upon any Matters of National Environmental Significance (MNES) listed under the EPBC Act.

2.2.2. Air quality and odour issues in exhibited EIS

The closest neighbours (land not owned by BSC) are in a mixed-use development just under 500 meters east of the development that includes apartments and commercial premises. The nearest rural residential dwellings are over 1 km to the west and the closest low-density residential area is approximately 800 meters away on the eastern side of Bayshore Drive. A large buffer is provided by a nature reserve to the north, and wetlands and playing fields to the

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south associated with the Cavanbah Sport and Recreation Centre. A light industrial estate around Centennial Circuit is around 600m to the south east.

An Air Quality Impact Assessment was undertaken for the EIS. CALPUFF Modelling System and The Air Pollution Model was used. This is based on *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (NSW DEC, 2005). The odour impact assessment found impacts from the proposed development would be low and would not lead to a level of odour likely to be noticed in the surrounding environment. If cumulative odour impacts from the BBSTP and BEF persistently occur, the BEF biofilter can be retrofitted to increase its odour removal performance and increase odour dispersion.

2.2.3. Traffic issues in exhibited EIS

A Traffic and Transport Impact Assessment was prepared for the proposed BEF. The SIDRA analysis of the Bayshore Drive/Wallum Place intersection indicated that it currently operates at Level of Service "A" during the morning and afternoon peak times. The additional traffic flows from the BEF development will not change the current Level of Service and will not result in any increase in total average vehicle delays.

The analysis indicates that the projected increase in traffic activity as a consequence of the proposed development will not have any unacceptable traffic implications in terms of road network capacity. The traffic volumes associated with construction of the BEF are expected to be lower than the operational traffic volumes. Therefore, construction traffic is unlikely to impact the surrounding road network.

2.2.4. Noise issues in exhibited EIS

A Noise and Vibration Impact Assessment (NVIA) was prepared for the proposed BEF. Noise modelling using SoundPLAN v7.4 predicted no impacts from mechanical noise on nearby sensitive receivers. Mechanical services noise levels are mitigated by enclosure in technical corridors that attenuate the noise. Mechanical services noise levels will be reviewed during the detailed design of the facility to confirm compliance with *NSW Noise Policy for Industry* (NPI) 2017.

During standard construction hours minor exceedances of the noise management levels (< 4 dB) are predicted at the closest residential and commercial receivers surrounding the site. These small NML exceedances do not trigger the need for specialist noise control measures under the *Interim Construction Noise Guideline* (DECC, 2009); however, the construction contractor will develop a Construction Noise and Vibration Management Plan.

The impact of increased traffic noise along Wallum Place and Bayshore Drive was calculated using traffic volume data from a 2019 traffic study conducted by Rytenskild Traffic Engineering for the Habitat development on Wallum Place. The traffic in this area already exceeds the *NSW Road Noise Policy* (DECCW 2011) criteria; therefore, traffic associated with this project must not result in an increase of more than 2 dB. Given the relatively small increase in vehicle traffic to be caused by the project the predicted noise increase associated with operational and construction vehicle movements is expected to be less than 0.1 dB, satisfying the RNP criteria.

2.2.5. Bushfire issues in exhibited EIS

A Bushfire Risk Assessment (BRA) was prepared for the EIS to determine the category of bushfire attack and construction level in support of the Proposal. 'Bushfire attack level', or BAL, quantifies the level of bush fire risk for a development. The vegetation surrounding the proposed BEF is protected due to its biodiversity values. A small part of the proposed BEF sits within BAL-FZ (direct exposure to flames from fire front). Additional clearing is not proposed as the area is considered to have high biodiversity value. The EIS presents a range of mitigation measures to manage the bushfire risks identified.

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The biogas storage dome is being constructed from a polyurethane membrane and thus is not consistent with general BAL-29 requirements as set out in the Building Codes of Australia. Therefore, additional bushfire suppression systems have been adopted to mitigate bushfire risk. The position of proposed BEF is the most suitable location considering bushfire threat, the size of the facility, Asset Protection Zone (APZ) and infrastructure whilst still being able to retain the native vegetation. The largest setbacks are incorporated around the administration building and delivery areas where occupants will be furthest from the fire hazard. The APZ will be managed in perpetuity.

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3. Analysis of submissions

A total of 71 general public submissions were received during the public exhibition period, including 10 from organisations and 61 from individuals.

In addition, submissions were received from a total of 5 government agencies.

3.1. General public submissions

Of the general public submissions received, all except one were objections to the proposal. As evidenced in Table 3.1 and Figure 3.1, the vast majority were related to potential impacts to the biodiversity of the surrounding wetlands. A matrix of all submissions is provided in Appendix H.

The main issues of concern were as follows:

- The EIS and biodiversity study did not adequately assess indirect impacts to the biodiversity of the wetlands. Primarily this included concerns that the chosen location including the access road at close proximity to the wetlands would cause impacts and disturbance to wetland biodiversity, including migratory and threatened bird species, due to operations of the BEF from increased noise, lights and vehicle traffic;
- Related to the above, the BEF would impact recreational and tourism-based bird watching activities;
- There was a lack of direct consultation with local community organisations (e.g. local and regional bird watching and conservation groups) previous to and during the development of the EIS;
- There would be an increase in traffic and noise impacts to the community of Byron Bay, particularly along the haul route to the STP (e.g. Bayshore Drive) and traffic impacts on current and future residential development; and
- The BEF may not be a feasible business investment for Council.

Other concerns included hazards and safety from the biogas, potential air quality and greenhouse gas impacts, referral to the Commonwealth under the EPBC Act, and exceedance of the Byron DCP height limits.

Many of the concerns raised were based on an incomplete understanding of the project. This report addresses each concern directly to provide the local community additional clarity and greater peace of mind regarding the proposed development. In response to some key concerns BSC has also made further improvements to the mitigation measures deployed at the facility and has been directly engaging with community groups and local residents to better understand their concerns and address their questions.

A detailed response to these community concerns is provided in the following sections of this report.

Table 3.1 Summary of primary issues raised during submissions.

Issue	No. of submissions raising this issue	Section where addressed in this RTS Report
Impact of the flare on fauna	2	Section 6.5.5
EIS should have been on all wetlands, not 0.8ha	2	Section 6.1.2
Access road too close to the wetlands will cause disturbance to fauna	18	Section 5.2 and 6.1
Traffic will impact birds and other flora/fauna lifecycles	34	Section 6.1
Proposed BEF location at STP wetlands not a good choice because of existing wetland values	43	Section 6.1.1

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Issue	No. of submissions raising this issue	Section where addressed in this RTS Report
No assessment of indirect impacts to biodiversity within the larger STP wetlands	46	Section 6.1.2
BEF will cause GHG emissions	6	Section 6.5.4
Air quality impacts due to haulage and BEF plant emissions	5	Section 6.5.1
Noise impacts to wildlife during construction and/or operation	19	Section 6.1.7
Disturbance to biodiversity (including threatened species) by construction and operation	51	Section 6.1.6 and 6.1.7
Lack of direct consultation with local community organisations (e.g. bird watching groups)	18	Section 6.2
Impacts to bird watching recreation activities and tourism	21	Section 6.1.8
Explosive gas storage on site is a safety concern to people and wildlife	3	Section 6.5.5
Impact to wildlife corridors	1	Section5.3.1, 5.4.1 and 6.1.2
Noise impacts to the community	10	Section 6.5.3
Traffic impacts to the community	14	Section 6.5.2
Height exceedence of BEF not supported	2	Section 6.5.6
Referral to Commonwealth / Federal legislation required	6	Section 6.1.3
No business plan, not a worthwhile investment, no cost-benefit analysis undertaken	10	Section 6.3
Impact of the flare on fauna	2	Section 6.5.5
Future growth is not accounted for in the development (wetland encroachment)	1	Section 6.4

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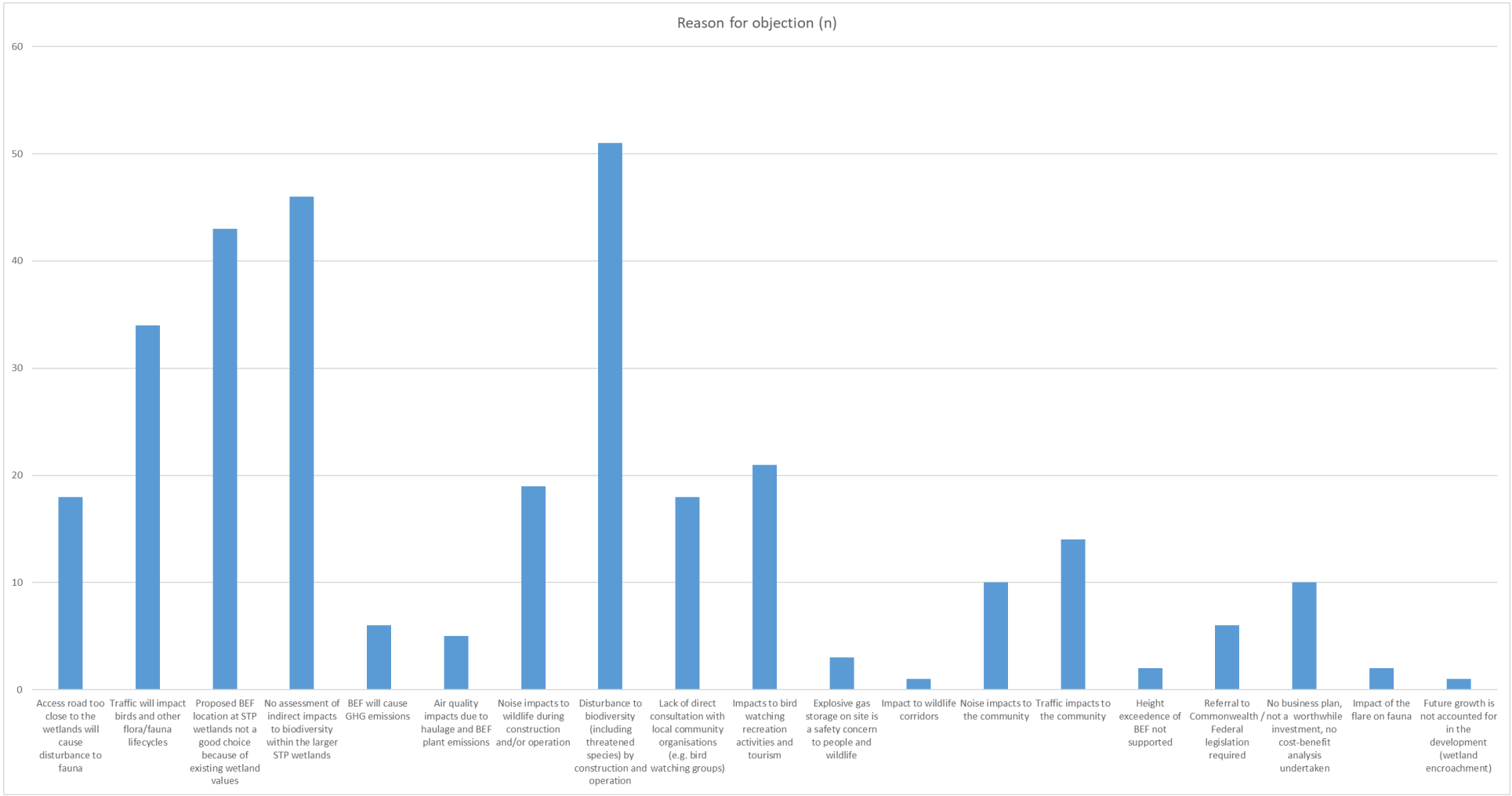
Figure 3.1 Summary of the issues raised during public submissions. The relative number of submissions raising each issue is shown on the left.



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3.2. Submissions by government agencies

Feedback on the Development Application was received from the following government stakeholders:

- Byron Shire Council (letter dated 6 October 2021);
- NSW Rural Fire Service (letter dated 28 October 2021);
- Transport for NSW (letters dated 26 October 2021 and 27 October 2021); and
- NSW Environment Protection Authority (first letter dated 6 August 2021 and second letter dated 10 August 2021).

A summary response to the Byron Shire Council RFI is presented in Table 4.1. The table provides a response to each comment or question, including cross referencing to a detailed response section and/or supporting studies provided in the Appendices.

A response to the NSW EPA was provided previously to the NSW EPA on 19 October 2021. General Terms and Conditions were issued 12 November 2021 and a licence can be issued by the EPA for the Proposed BEF. A response was provided direct to the NSW Rural Fire Service on 2 December 2021. The additional proposed mitigation measures above those provided in the EIS have also been provided in this RTS report (see Table 8.1).

Transport for NSW indicated in their 27 October 2021 letter that they had reviewed the exhibited EIS and had no further comments on the Proposal.

It is noted that the Northern Regional Planning Panel Record of Briefing (dated 22 September 2021) also contained key issues that were discussed regarding the proposed BEF. These issues all relate to the issues and concerns BSC and the public brought up in submissions, therefore they are also dealt with extensively in the following sections.

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4. Response to Byron Shire Council Submissions

Comments by Byron Shire Council in their letter dated 6 October 2021 have been addressed within Table 4.1 below.

Table 4.1. Response to Byron Shire Council request for information (letter dated 6 October 2021).

Issue	Byron Shire Council Comment	Response / How Addressed
Acid Sulfate Soils (ASS)	An Amended ASS Management Plan is required that assess the management of ASS leachates and groundwater in the context for the threatened wallum frog species habitat requirements. The report should also address: a. Groundwater quality and management and fate of any extractions b. Fate of any spoil c. Fate of leachates d. Fate of any dewatering discharges	It is expected that screw pile foundations will be used. This will reduce bulk excavations at depth and the likelihood that any ASS or acidic groundwater will need to be treated. If ASS is found during excavation, it will be treated within a designated treatment pad area. Leachate and/or runoff from rainfall will be captured in a lined basin and pumped out to a mobile tanker for disposal to a suitably licenced facility. The ASS treatment pad size and location, including retention on site of a 100yr storm event is noted in the updated construction soil and water management plan (CSWMP) prepared by MPC (Appendix F). The Acid sulphate Soil Management Plan (ASSMP) Appendix G) has been updated by Douglas Partners to provide details of the treatment methodology. Any contaminated water will be captured and retained on-site, pumped out and disposed of to a suitably licensed facility. If treatment of ASS is required during bulk excavations, then stormwater runoff and leachate captured during this treatment will be pumped out for disposal to a suitably licensed facility. No discharge to the environment/adjacent ground surfaces will be required during bulk excavation and treatment of ASS. If required, the relatively small quantities of excavated and treated ASS involved will be disposed off-site at a suitably licenced facility. Other non ASS spoil will be reused onsite where possible or removed offsite for disposal at a suitably licensed facility.
Truck washdown Area	Please provide details or refer council to the documents that detail the waste water management strategy for the truck wash down area.	Where required, trucks will be washed out in the receival hall before collection of compost for dispatch to customers or transfer to Myocum. Leachate and wash down water generated in the receival hall will be contained in the hall by bunding,

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Issue	Byron Shire Council Comment	Response / How Addressed
		collected in the receival hall pump sump, and reused in the process. By design, the Receival Hall does not drain to the external stormwater sump. Leachate (also known as percolate) from both aerobic and anaerobic processes is stored in the percolate tank (600 m3 capacity). The process is designed for zero liquid discharge, however, in the unlikely event that excess leachate is generated by the process, it will be pumped out from the percolate storge tank and treated at a suitably licensed facility. The wheel wash and rumble grid will be located on the access road between the weighbridge and the entrance off Wallum Place. This is shown in the revised site layout in Appendix B. Wheel wash systems are designed recirculate and filter wash water. Where excess wheel wash water accumulates, it will be pumped out and treated at a suitably licensed facility.
Ecological Matters	**Assessment area** The BDAR considered the 'subject land' (i.e., the area subject to the Biodiversity Assessment Method) to be restricted to the proposed development footprint area. It is considered that the subject land should be an expanded area that includes additional surrounding areas likely to be impacted by the proposal. However, it is acknowledged that the BAM 2020 defines 'subject land' as: "land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the assessment area which surrounds the subject land (i.e. the area of land in the 1500 m buffer zone around the subject land or 500 m buffer zone for linear proposals)". It is therefore acknowledged that Council may not be able to require additional surveys in the broader surrounding area, even though these are necessary to properly understand the impacts of the proposal. Notwithstanding, the BAM does require that all indirect impacts of the proposal need to be assessed in the BDAR.	Indirect impacts were assessed in the original BDAR for the proposed BEF, specifically in Section 5 and Section 6 of the BDAR. The BDAR has been updated to provide further clarification and justification that no significant indirect impacts are expected due to the proposed BEF. The updated BDAR is provided in Appendix D. Further discussion of potential indirect impacts is provided in Section 6.1 of this report.
Ecological Matters	**Assessment of indirect impacts** The following potential indirect impacts of the proposal were not adequately addressed in the BDAR and need to be included:	Indirect impacts were assessed in the original BDAR for the proposed BEF, specifically in Section 5 and Section 6 of the BDAR. The BDAR has been updated

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Issue	Byron Shire Council Comment	Response / How Addressed
		to provide further clarification and justification that no significant indirect impacts are expected due to the proposed BEF. These are summarised in Section 6.1 of this report. The updated BDAR is provided in Appendix D.
Ecological Matters	Additional vehicle movements: It is likely that additional vehicle movements will impact threatened bird species inhabiting the adjacent wetland areas. These impacts need to be considered for both the construction and operational periods. The BDAR stated that any additional vehicle movements will be limited to the construction period. This is inaccurate as the operational period will involve additional vehicle movements to transport waste and product into and out of the site.	As provided in the Noise Impact Assessment, the maximum future operation of the site is estimated to generate up to 8 heavy vehicle trips per day. In addition, the site may also generate up to five (5) light vehicles movements from staff and visitors attend during a normal working day. A maximum of 7 vehicle movements (5 staff and 2 truck movements) are predicted to occur during peak periods on the roads. Construction traffic will consist of 4 semi-trailer (19m) vehicles per day. The expected traffic during construction and operation of the proposed BEF is minimal and with the relocation of the access road to the existing entrance north of the STP buildings and enforcement of truck speed limits the BDAR has assessed that the BEF would have negligible impact to the biodiversity of the wetlands. Further details and a justification are provided in Section 6.1 of this report. The updated BDAR is provided in Appendix D.
Ecological Matters	Noise and light impacts: the BDAR concluded that the additional noise and light introduced by the proposal will have no impact on threatened fauna. However, it is considered that this understates the impacts of the ongoing operational activities that are proposed on the site. In particular, the additional anthropogenic noise pollution that will result from heavy vehicle movements adjacent to the existing retention cells are likely to cause threatened fauna impacts such as avoidance of noisy areas and changes in reproduction. This is particularly important for the more shy, secretive bird species occurring in the locality.	Appropriate mitigation measures as proposed in the EIS will be implemented to minimise potential impacts. Potential noise and light impacts on biodiversity due to construction and operation of the proposed BEF are not expected to be significant. The BEF site layout plan has been updated (Appendix B) to locate the access road further north and internal to the STP so it is further away from the constructed STP wetlands. Speed limits will include the following: • 40Km/hr on Wallum Place • 20km/hr on STP internal access road • 10km/hr in truck turning area and receival hall

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Issue	Byron Shire Council Comment	Response / How Addressed
		Section 6.1 in this report provides further details addressing concerns over potential noise and light impacts from construction and operation of the proposed development. The updated BDAR is provided in Appendix D.
Ecological Matters	Treatment of potential acid sulfate soils: The locality forms part of a complex of acidic coastal heath wetlands and swamp sclerophyll forests. The native biodiversity in these areas is sensitive to changes in hydrology and water quality (notably pH). The excavation and treatment of ASS on the site has the potential to have neutralisation effects on the adjacent wetland areas which may impact pH-sensitive biodiversity such as Litoria olongburensis and Crinia tinnula. No detail was provided regarding where neutralised soil would be deposited or how any potential resulting impacts on adjacent environments would be mitigated.	It is considered very unlikely that Acid Sulfate Soils (ASS) could be uncovered and allowed to contaminate surface water and run-off the site in a manner that would cause significant acidification or neutralisation of the surrounding wetland habitat. The ASS treatment pad will be bunded, as will (in addition) the entire area being disturbed by the construction process. The treatment of ASS can be controlled to achieve a suitable pH for use as fill in this environment. Where pH is raised too high in error, the relatively small quantities of excavated soil involved will be disposed off-site at a suitably licenced facility. The risks of ASS release during and post construction have been heavily studied in the design and engineering phase of the project. It is expected that screw pile foundations will be used for the facility, this will reduce bulk excavations at depth and the likelihood that any ASS or acidic groundwater will need to be treated. If ASS is found during excavation, it will be treated within a designated treatment pad area. Leachate and/or runoff from rainfall will be captured in a lined basin and pumped out to a mobile tanker for disposal to a suitably licenced facility. The ASS treatment pad size and location, including retention on site of a 100yr storm event is noted in the updated construction soil and water management plan (CSWMP) prepared by MPC (Appendix F). The Acid Sulphate Soil Management Plan (ASSMP) has been updated by Douglas Partners to provide details of the treatment methodology (see Appendix G). Any contaminated water will be captured and retained on-site, pumped out and disposed of to a suitably licensed facility.
Ecological Matters	Dewatering: If dewatering is to be undertaken during excavation, details of the cone of depression as well as the treatment and point of discharge of groundwater must be provided and assessed in relation to potential impacts on the hydrology and water quality of the adjacent wetland areas and associated biodiversity.	It is not expected that any groundwater dewatering will be required for this development. Based on the groundwater study investigations undertaken by Douglas Partners the water table will be more than 1 metre below the constructed ground level for the BEF. In the unlikely event the ground water table is encountered during excavation, the water will be pumped-out and disposed of at a suitably licensed facility. If dewatering is required during construction, the water

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Issue	Byron Shire Council Comment	Response / How Addressed
		is likely to be surface runoff from rainfall entering the excavations, not groundwater. As shown in the proposed cut plans included in Appendix F of this RTS, and supported by the Preliminary Site Investigation and Geotechnical study provided in the EIS, our rationale is: • The cut to fill phase is expected to take no more than 2 weeks; • Groundwater is at 1.4m (Bore 8) and 1.1m (Bore 11) below ground surface, while most of the excavation will be <1m; and • Cut >1m occurs mainly adjacent to existing STP infrastructure, which is on ground at a higher RL due to previous construction and fill and, therefore, is highly unlikely to encounter groundwater.
Ecological Matters	**Avoid and minimise impacts on biodiversity values** It is considered that the proposal design did not adequately consider avoiding and/or minimising biodiversity impacts as required by Part 7 of the BAM 2020. In particular, as outlined above the proposed site access road will introduce additional vehicle movements within close proximity to important bird habitat represented by the retention cells to the east and south of the existing STP facility. It is noted that there is an alternative existing road that runs adjacent to the solar panels in the west of the STP that was not considered for the site access. Using this road would greatly reduce impacts on the habitat values of the retention cells. The proposal should be redesigned to utilise this alternative route for the site access.	Whilst the BDAR assessed that the proposed access would not significantly affect the surrounding wetland biodiversity values, the access road has been reviewed. The access is now proposed via the existing entrance to the north of the STP buildings and upgrading the existing internal STP access roads. These are shown in the updated site layout plans provided in Appendix B and further discussion is provided in Section 6.1 of this report.
Ecological Matters	**Assessing the habitat suitability for threatened species** The locations of deployed Song Meters were not shown in Figure 10.	The updated BDAR included in Appendix D now includes the locations of deployed Song Meters in figure 10 of the BDAR.
Ecological Matters	**Byron Coast Comprehensive Koala Plan of Management/State Environmental Planning Policy (Koala Habitat Protection) 2021** The Environmental Impact Statement provided with the application addressed the State Environmental Planning Policy (Koala Habitat Protection) 2019. For the subject site, the relevant koala planning policy is the Byron Coast Comprehensive Koala Plan of Management (CKPoM)	The Koala SEPP section of the BDAR (Appendix D) has been updated to mention the presence of 'potential koala habitat' (which we now understand has the same meaning of 'core koala habitat') per the Byron Coast Comprehensive Koala Plan of Management (CKPOM) and detail the requirement for a 'Standard Koala Habitat Assessment Report' to accompany the development.

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Issue	Byron Shire Council Comment	Response / How Addressed
	which was approved with the commencement of the State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP 2021). The BDAR did address the Koala SEPP 2021 and mentioned the CKPoM. However, it contended that no core koala habitat occurs on the site. This is incorrect. The subject site (Lot 2 DP 706286) is within the Brunswick Heads – Tyagarah Koala Management Precinct and contains core koala habitat mapped under the CKPoM. Therefore, the application must address Part 12 – Development Assessment and Control of the CKPoM.	Part 12 – Development Assessment and Control of the CKPoM has been addressed on request and a 'Standard Koala Habitat Assessment Report' prepared and included in Appendix E of this report to meet the requirements of 12.2.2 of the CKPOM.
Ecological Matters	**Byron Shire Development Control Plan - Chapter B1 Biodiversity** The BDAR addressed the broad biodiversity planning principles in Section B1.1.5 of Chapter B1 of the DCP. One of these, P13: Avoid and minimise, needs to be reconsidered in line with the above comments regarding the 'avoid and minimise' requirements of the BAM. The BDAR did not address the specific prescriptive measures relevant to the proposal that are defined in Sections B1.2.1, B1.2.2, and B1.2.4 of the DCP. Some of these overlap with information requested above in association with the BAM requirements.	While the BDAR does not explicitly list these subsections (i.e. 1.1.1, 1.2.2 o 1.2.4) as subheadings in the BDAR, the intention of these controls are addressed in full throughout Section 6 and Section 7.6 of the BDAR. The prescriptive measures defined in defined in Sections B1.2.1 of the DCP are addressed in full in Section 5 of this report.
Ecological Matters	**B1.2.1 Development Envelope Controls** This section requires that development must be designed to retain ecologically significant areas (also referred to as 'red flags') on-site and incorporate ecological setbacks to these areas at the distances listed in Table 3. The subject site includes the following ecologically significant areas listed in Table 3: • Important wetlands (mapped under the Coastal Management SEPP) – 50m setback required • Other wetlands – 20m setback required • Threatened ecological communities – 30m setback required • Threatened and significant species – 20m setback required	Whilst the footprint overlaps with several ecological setback guidelines in the BLEP 2014, the Proposal footprint is located within previously cleared land consisting of mixed weeds and exotic grasses and is regularly slashed and mowed for STP operations. The proposed development is consistent with the objectives of the Byron DCP Chapter B1 Biodiversity. Under B1.2.1, Section 6, of the BDCP 2014, minor variations to the red flagged areas may be considered to achieve practical outcomes. Therefore, BSC seeks a variation to the development envelope controls affecting the Proposed BEF footprint as described in Section 5 of this report.

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Issue	Byron Shire Council Comment	Response / How Addressed
	Pre-existing protected habitat may also occur on the site (20m setback required). Any additional protections for habitat on the site that may have been established under previous stages of the STP (e.g., via conditions of consent) should be considered.	A review of previous STP approval stages approval conditions, including the Byron sewage augmentation scheme, showed there are no additional habitat protections or controls that would affect construction and operation of the proposed BEF. The STP constructed wetlands can continue to be managed for sewage treatment operational requirements and biodiversity wetland values.
Ecological Matters	**B1.2.2 Development infrastructure and controls** This section must be addressed in relation to the design of the infrastructure associated with the proposal. In particular, the prescriptive measures relevant to roads, fencing, and noise and lighting must be addressed. Some of these prescriptive measures overlap with the information requested above in relation to the BAM requirements.	While the BDAR does not explicitly list these subsections (i.e. B1.1.1, B1.2.2 or B1.2.4) as subheadings in the BDAR, the intention of these controls are addressed throughout the BDAR, particular Section 6 and Section 7.6 of the BDAR. The proposed development will include these mitigation measures, as proposed (summarised in Section 8 of this report). In addition to these measures, site access has been moved further north and will use internal existing STP roads to access the BEF. This new layout is detailed in the updated site plans in Appendix B of this report.
Ecological Matters	**B1.2.4 Ecological assessment** The prescriptive measures of this section include the requirement for a site plan and current aerial photo (at a scale of 1:200 or better) showing the extent of any red flagged areas and ecological setbacks as defined in Table 3 in relation to the proposed development envelope. This plan should be included in the BDAR.	The BDAR has been updated to include the site plan overlaid on a current aerial photo (at a scale of 1:200 or better) showing the extent of any red flagged areas and ecological setbacks as defined in Table 3 of the 'DCP Chapter 1 Biodiversity' in relation to the proposed development envelope. The plan overlay is also included in Figure 5.1 of this report.

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5. Development Envelope Controls

This section has been prepared in relation to request for a variation to the development envelope controls in Chapter B1 (Biodiversity) of the BLEP 2014, which provide prescriptive measures for ecological setbacks.

Whilst the Proposal footprint is located within previously cleared land consisting of mixed weeds and exotic grasses, and is regularly slashed and mowed for STP operations, the footprint overlaps with several ecological setback areas as defined in the BLEP 2014.

Byron Shire Council seeks a variation to the development envelope controls affecting the Proposed BEF footprint as described below.

5.1. Development Control Plan Requirements

According to the BDCP 2014, the development envelope controls were designed to retain ecologically significant areas (also referred to as 'red flags') on-site and incorporate ecological setbacks to these areas at the recommended distances in Table 3 in Chapter B1 of the BDCP 2014. These are reproduced in Table 5.1 below, which summarises the ecological setbacks that apply to the Proposal. Figure 5.1 illustrates the relationship of the Proposed BEF footprint to the setbacks.

Whilst several of the setbacks cannot be achieved, the proposed BEF has been designed in a manner that is consistent with the setback objectives. The development envelope has been shaped and positioned to avoid directly impacting upon any ecologically significant area. No area of important wetland or threatened ecological community will be directly impact by the development. This will ensure 'no net loss of biodiversity' through the principles of avoiding and minimising development impacts.

The development is positioned within the 'Ecological Setback' area of an 'Important Wetland' (Coastal Management SEPP Wetland) and a 'Threatened Ecological Community' (Swamp Sclerophyll Forest EEC). However, it is important to note that this 'Ecological Setback' area consists entirely of mown, manicured derived exotic and native grassland monocultures. The native grassland consists of widely cultivated species and holds little biodiversity significance.

Effort has been taken to ensure that the development does not significantly impact upon the important ecological features that the setbacks were established to protect.

Impacts to the important wetland and impact mitigation measures are discussed in the BDAR and summarised in this RTS report.

The proposed development will not significantly impact upon any ecologically significant areas (red flags) to which the Ecological Setback DCP has been established to protect. The development has been designed and will be managed to ensure that areas to be retained are adequately protected and managed to guarantee their long-term ecological viability.

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Table 5.1. Ecological setbacks relevant to the Proposal (Source: Byron Shire DCP B1.2.1 Table 3).

Red flag	Description	Prescribed Setback (m)	Proposed Setback Achieved?
Important wetlands	(Wetlands protected under NSW State or Commonwealth legislation or policy. Includes wetlands mapped under the NSW State Environmental Planning Policy (SEPP) Coastal Management 2018, previously SEPP 14 Wetlands).	50	No
Other wetlands	Any other wetland other than an Important wetland. Wetland has the same meaning as defined within NSW Wetland Policy: • Wetlands are areas of land that are wet by surface water or groundwater, or both, for long enough periods that the plants and animals in them are adapted to, and depend upon moist conditions for at least part of their lifecycle. They include areas that are inundated cyclically, intermittently or permanently with fresh, brackish, or saline water, which is generally still or slow moving except in distributary channels such as tidal creeks which may have higher peak flows. • Examples of wetlands include; mangroves, backwaters, sedgelands, wet heathlands, lakes, lagoons, estuaries, rivers, floodplains, swamps, bogs, billabongs, marshes, coral reefs and seagrass beds).	20	No
Threatened ecological communities	Includes Critically Endangered, Endangered or Vulnerable listed under State or Commonwealth legislation.	30	No
Threatened and significant species	Areas with a species polygon for threatened fauna or other significant fauna that are known or predicted to occur at the site. (Threatened fauna or flora is any species listed as critically endangered, endangered or vulnerable under NSW State or Commonwealth legislation.	20	This setback is nested within the 'Other wetlands' setback

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Figure 5.1 Ecological setbacks in relation to the Proposed BEF. (Source: LandEco 2021).

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5.2. Allowance for Variation to Setbacks

Under B1.2.1, Section 6, of the BDCP 2014, minor variations to the red flagged areas may be considered to achieve practical outcomes. Examples provided in the BDCP 2014 include:

- Minor incursions into the ecological setbacks;
- Ecological setbacks that necessarily overlap with access roads or other linear infrastructure (e.g. a narrow access road that does not require clearing with native vegetation on each side);
- Isolated patches of native vegetation with an area of less than 1000m^2;
- Ecological setbacks arising from adjoining land not in the same ownership
- Threatened or other significant fauna that are considered vagrant, highly nomadic, or are not closely associated with the habitat on site;
- Areas subject to a controlled activity approval under the Water Management Act 2000.
- Threatened or other significant flora that occur as seedlings or saplings outside of their natural habitat.

Any minor variation must not trigger a subsequent red flag in another area or conflict with any statutory consideration that requires the retention of that area.

Section 8 Under B1.2.1 of the Byron Shire DCP provides that a development application seeking a minor variation must:

- Clearly demonstrate the variation sought;
- Demonstrate that alternative layouts have been considered and that the impacts cannot reasonably be avoided; and
- Show how the variation impact is consistent with the relevant planning principles and objectives of this DCP Chapter.

5.3. Justification of the Variation to the Development Envelope Controls

Variation to allow the Proposed BEF to be located within the development envelopes as described in Chapter B1 of the BDCP 2014 (and reproduced above) is requested and justified due to the following:

- The proposed development is within an existing fenced and cleared area that is slashed and mown as part of the Byron Bay STP existing operations;
- Vegetation proposed for removal is weed infested and exotic grasses providing very little foraging habitat for native species;
- No native trees are proposed to be cleared;
- Existing infrastructure of the Byron STP site will be used for access and utilities. No new roads are proposed;
- The proposed access has been moved away from the constructed wetlands to the east and is now proposed to be located internal to the Byron Bay STP infrastructure;
- There are no changes to the management and operations of the constructed wetlands for sewage treatment and their maintenance as high biodiversity value wetlands;
- A BDAR has been prepared and accompanied the EIS and concluded that no significant direct or indirect impacts to biodiversity of the wetlands and associated flora and fauna are expected;
- The High Value Biodiversity mapping has been adjusted to reflect the degraded and weedy nature of the proposed footprint and surrounds. High Value Biodiversity Lands is no longer located on the Proposed BEF footprint; and

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- The development is for the public good, provides an example of sustainable and appropriate technology in managing solid waste whilst generating fully renewable carbon-negative electricity, and provides a vital service for the recycling and reuse of organic wastes (including biosolids) generated in the Byron Shire

Further details on the suitability of the site and justification for the variation are provided below.

5.3.1. Suitability of the Facility to be Located at the Existing Byron STP Site

The Proposed BEF will be integral to the existing operations of the Byron STP and provide the means for resource recovery of biosolids whilst producing biogas for energy production to run the STP. The Proposed BEF is for the public good offering a best practice and sustainable solution for organic wastes generated by residents and businesses in the Byron Shire.

The proposed footprint of the development is located in an existing cleared area that is slashed and mown as part of the Byron STP existing operations. No changes to the constructed wetlands are proposed under this development application. The constructed wetlands will continue to be managed for their wastewater treatment capability and for their high value biodiversity attributes.

No additional access is required to be built as the existing access internal to the STP site will be used. There are no wildlife corridors that would be intersected or blocked by the Proposed BEF. The site is mixed weeds and exotic grasses, and no native trees or high value native vegetation will be cleared.

Construction will be managed through enhanced soil and water controls that exceed 'Blue Book' best practice standards. This includes capture and retention of the 100-year storm and pump out for disposal to a licensed facility of any stormwater or groundwater collected during bulk earthworks and acid sulfate soils treatment (if required).

Operations will be internal to the Receival Hall and Tunnels, which will be operated and managed according to best practice technologies and in line with NSW legislation and NSW EPA guidelines and policy.

The BEF has been developed on the small footprint and therefore minimises the impervious area where stormwater will be generated. Rainwater falling on impervious roof and road surfaces (which are considered relatively "clean" as operations are internal to the Receival Hall) will be managed by:

- Collection of roof water in a 250-kilolitre water tank for use as process water or diversion to the underground underground onsite stormwater detention tank and filtration system;
- An underground onsite stormwater detention tank and filtration system that collects all stormwater before filtration and diversion to the neighbouring wetlands; and
- A small stormwater detention basin at the intersection of the access road and Wallum Place.

It is unlikely there will be any appreciable indirect impacts on biodiversity arising from the development proposal that have not been addressed in this EIS, especially when considering the nature and scale of the proposed development; the character of the study area; the historic disturbance and fragmentation, and maintenance of vegetation within the property in conjunction with the proposed impact mitigation measures listed in the EIS. Only the direct impacts associated with vegetation clearing and construction of the proposed BEF will require biodiversity offsets according to the Biodiversity Development Assessment Report (BDAR), covered in further detail below.

5.3.2. Alternative Locations Considered

As discussed in the EIS, Byron Shire Council operates a composting facility located at the Byron Resource Recovery Centre that, under its Environmental Protection Licence (EPL), is restricted to processing green waste. There are no alternative solutions for the processing of putrescible organic wastes, including food wastes, in the Byron Shire,

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resulting in this waste being transported long distances to neighboring shires and interstate for resource recovery or being landfilled (where it is not source separated).

There have been a variety of studies and reports prepared in the last eight years that look at the opportunity of bioenergy production in Byron Shire through various technologies. These are explained in detail in the EIS and a summary is provided in Section 6.1.1 and Table 6.1 of this RTS report.

5.3.3. Alternative Layouts and Designs Considered

The proposed development footprint has gone through several design revisions since 2019, as shown in Appendix C.

5.3.3.1. Development Footprint

The original development design required the clearing of small patches of native vegetation within the STP lot. However, the design was altered to avoid clearing this vegetation. The retention and protection of all trees surrounding the proposed BEF site has been confirmed by an experienced, qualified Consulting Arborist. As a result, the development will only require the clearing of those weed and exotic grass areas described in Section 5.3.4 of this report. No clearing of native trees is required.

Mitchells Rainforest Snail is the only endangered species that was found during BAM surveys within the development footprint, with an additional four vulnerable species predicted to occur. No threatened ecological communities occur within the development footprint. There will be no loss of any extent of threatened ecological community because of the proposed development.

To provide certainty that the impacts on the Mitchells Rainforest Snail will not be considered significant under the Environment Protection and Biodiversity Conservation Act 1999, Byron Shire Council submitted a referral to the Commonwealth Department of Agriculture, Water and the Environment on 7 June 2021, as described below.

5.3.3.1. Vehicular Access

As discussed in the EIS, an alternative dedicated truck access road was considered along the eastern boundary of the Byron STP lot to connect Wallum Place with Ewingsdale Road near the entrance to the Cavanbah Centre. However, this route would have required significant clearing of vegetation and construction in areas of high biodiversity value coastal wetlands and would therefore result in greater overall environmental impact than using Bayshore Drive and Wallum Place for truck access. This option was excluded from the proposal and replaced with a proposed access to the east of the STP adjacent to the constructed wetlands along an existing gravel access track.

Post exhibition of the EIS, access has been refined further to reduce potential impacts to fauna using the constructed wetlands for habitat to the east of the Proposed BEF. The access road has now been relocated and placed to the north on an existing paved road internal to the existing STP. Use of this access does not require clearing of vegetation and will reduce the potential impact of any vehicle movement or noise disturbance on fauna using the constructed STP wetlands.

5.3.4. Completed Biodiversity Development Assessment Report

Section B1.2.4 of the BDCP 2014 requires that development proposals assessed under the EP&A Act on land within or adjacent to High Environmental Value (HEV) vegetation and/or red flags, an ecological assessment may be required. This requirement is in addition to any other statutory requirements or provisions as defined under other legislation (e.g. Coastal Management SEPP 2018 or Koala Habitat Protection SEPP 2019).

A Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the requirements of the Biodiversity Conservation Act 2016 (BC Act) and the Biodiversity Assessment Method (BAM) to accompany the EIS and development application for the Proposed BEF. Since the development of the BDAR, the High Biodiversity Value

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mapping for the area has been updated. The result is that the proposed development footprint does not affect HBV lands. The BDAR has therefore been prepared by BSC voluntarily.

The BDAR concluded that the following vegetation would be cleared:

- A maximum of 0.36 hectares of non-native vegetation comprised of weed-dominated pastures; and
- Up to 0.52 hectares of plant community type (PCT) 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion.

The PCT 1064 is of extremely poor quality, does not qualify as an endangered ecological community (EEC) under the BC Act, and does not require biodiversity offsets. No threatened ecological communities were identified in the development site or require removal. No threatened flora species were recorded in or near the proposed development site.

Targeted threatened fauna surveys were carried out in January, March and April 2021. There was initially determined to be an offset for loss of foraging habitat (albeit degraded and weed-infested) for species credit species were recorded or assumed present on the proposed BEF site:

- Thersites mitchellae (Mitchell's Rainforest Snail) (BC Act: Endangered/SAII; EPBC Act: Critically Endangered)
- Crinia tinnula (Wallum Froglet) (BC Act: Vulnerable)
- Litoria olongburensis (Wallum Sedge-frog) (BC Act: Vulnerable; EPBC Act: Vulnerable)
- Myotis macropus (Southern Myotis) (BC Act: Vulnerable)
- Planigale maculata (Common Planigale) (BC Act: Vulnerable)

The BDAR concluded that development of the Proposed BEF will have a low biodiversity impact, and no significant impacts on threatened species of communities. Correspondence from NSW DPIE Biodiversity and Conservation (letter dated 20 October 2021) confirmed that as impacts from the proposed BEF are unlikely to significantly affect threatened species, ecological communities or their habitats, there is no requirement to enter the Biodiversity Offset Scheme (BOS).

Whilst Council does not impose any retiring of biodiversity offset credits, instead Council has now agreed to fund biodiversity conservation actions in the constructed wetlands that form part of the BBSTP sewage treatment works in consultation with local environment groups. Examples of potential conservation actions include:

- The installation of two artificial nest poles to encourage breeding by Black-necked Stork and/or Osprey; and
- Sourcing local provenance bird attracting flora for installation in a 'living fence' near the proposed development footprint.

These measures to enhance biodiversity values via the proposed BEF have been included in Table 8.1 of this RTS report.

The benefits that the Proposed BEF will bring to the community of Byron Shire outweigh the impacts to biodiversity. Subject to effective implementation of the impact mitigation and offset requirements of the BDAR, the development should proceed to approval and implementation.

5.3.5. EPBC Referral

A referral report was prepared and submitted to the Australian Department of Agriculture, Water and the Environment (DAWE) on 7 June 2021 to assess the likelihood of occurrence of Matters of National Environmental Significance (MNES) listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) along with an assessment of the significance of impact of the proposed development upon all MNES that are confirmed present or considered likely to occur in the location of the Byron Bay Energy Facility (BEF). The report included a summary of the BDAR as relevant to the referral and was exhibited for consultation for 10 business days.

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A decision was provided by DAWE on 27 July 2021 that the proposed development is not a controlled action, and not likely to incur a significant impact upon any MNES listed under the EPBC Act. To mitigate any potential impacts, a Mitchell's Rainforest Snail Salvage and Relocation Management Plan has been prepared and will be implemented for the Proposed BEF. These measures include:

- No pesticides will be used when constructing and operating the Proposed BEF;
- Fencing capable of preventing the entry of Mitchell's Rainforest Snail will be installed around the outward-facing perimeter of the Proposed BEF.

These mitigation measures are included in the EIS and will be implemented to ensure potential impacts to the Mitchell's Rainforest Snail are prevented and or minimised to the greatest extent possible.

5.3.6. Summary of Improvements and Design Changes

As summarised in Table 5.2, improvements to the BEF have included design changes to the footprint and access as proposed.

Table 5.2. Improvements and design changes to mitigate potential biodiversity impacts.

Issue	Potential impacts	Design changes
Footprint	Biodiversity mapping showed high biodiversity value land and survey found critically endangered species.	The development footprint was adjusted to remain inside the existing southern fence of the Byron STP. Development was extended to no more than 15 m beyond western fence to avoid areas of high biodiversity value and existing habitat trees in the northwest corner of the site.
Access	Alternative proposal along the eastern boundary of the Byron STP lot to connect Wallum Place with Ewingsdale Road near the entrance Bayshore drive would require clearing of high biodiversity value vegetation. Proposed access road adjacent to the constructed wetlands on the eastern boundary of the Site would cause potential disturbance to fauna using constructed wetlands.	The access road has now been relocated to the north on an existing gravel road internal to the existing STP. No vegetation clearing is required, and the new location will reduce potential impacts of any vehicle noise disturbance from operations of the Proposed BEF to fauna using the constructed STP wetlands. In addition, a "living fence" to be installed to provide habitat whilst also protecting fauna species near the site.
Plant and equipment noise and vibration	Night-time noise exceedances for blowers potential disturbance to fauna.	Mitigated by suitable enclosure of the technical corridors which contain the blowers (attached to the compost and AD tunnels).
Soil and water disturbance during construction	Potential disturbance of groundwater and potential acid sulfate soils causing release of sediment and acid runoff into the environment.	Civil design minimised disturbance of groundwater and export of fill, and use of screw pile foundations to reduce bulk excavations at depth and the likelihood that any acid sulfate soils or groundwater is disturbed. Where dewatering is required, additional water quality testing and treatment to occur prior to discharge. The ability to capture and detain stormwater runoff on-site of up to the 100-year event, and pump out of any contaminated water to a suitably licensed facility.

5.3.7. High Value Biodiversity Land Mapping

A trigger for the Biodiversity Offset Scheme is the clearing of native vegetation from areas mapped 'purple' on the Biodiversity Values (BV) Map. The proposed development requires no clearing of native vegetation from within an area mapped on the BV Map. The decision to prepare a BDAR was self-elected by BSC to ensure a high duty of care such that impacts to biodiversity of important wetlands were rigorously assessed.

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Further details how the BV Map relates to the proposed development is provided in the BDAR (Appendix D of this report).

5.4. Consistency with BDCP 2014 Objectives

5.4.1. Objectives of Chapter B1 Biodiversity

The Byron Shire DCP chapter B1 Biodiversity supports climate change adaptation through the principle of avoidance in the first instance, and subsequently minimisation, wherever avoidance is proven to be untenable. The DCP notes that to avoid means "to keep away from". Evidence of avoidance may be illustrated through the use of ecological buffers, the design of a development footprint, or by regulating the timing or location of activities. If it is not possible to avoid impacts, then opportunities should be sought to minimise the impacts. Minimise means "reduce to the smallest possible amount or degree".

As described in this report, the layout of the Proposed BEF has been modified and updated several times to ensure prevention and minimisation of impacts to biodiversity. Extensive efforts have been made to ensure the proposed BEF is compatible with the overall management and use of the Byron STP and associated high value constructed wetlands via development of a BDAR, mitigation measures, EPBC referral, and consideration of the reasons for High Biodiversity Value mapping.

The aim of Chapter B1 Biodiversity is to ensure that, subject to any relevant overarching state or commonwealth legislation, the planning and design of new development maintains or improves ecological values within Byron Shire thereby increasing the resilience of our natural areas and supporting both biodiversity and climate adaptation. The following seven objectives given in Section B1.1.1 are provided below along with a statement of how the Proposed BEF remains consistent with each objective:

1. *Identify, retain and restore native vegetation and habitats for native species in patches of a size and configuration that will enable existing plant and animal communities to survive in the long term and support climate adaptation.*

The BDAR identified areas of high value habitat and the Proposed BEF footprint has been modified to retain these areas including the small clump of habitat trees located adjacent to the north side of the footprint. The retention of favourable habitat and continuing management of the constructed STP wetlands will enable the continuation of existing plant and animal communities.

2. *Identify and retain high carbon storage ecosystems (e.g. blue carbon systems such as salt marsh, mangroves and sea grasses), wildlife corridors and refugia.*

As detailed in the BDAR, the Proposed BEF will not disturb or impact on high carbon storage ecosystems, wildlife corridors and refugia. The constructed wetlands will continue to be managed by Byron Shire Council for polishing sewage and providing wetland habitat for flora and fauna. Byron Shire Council has demonstrated that it can manage a public utility while enhancing an adjacent wetland area to the point where it is widely recognised as having high biodiversity value.

3. *Provide development controls that prevent the degradation or loss of ecological values and or biodiversity.*

The Proposed BEF footprint has been adjusted based on the results of the BDAR that was prepared for the project. The land over which the Proposed BEF is located provides minimal habitat value and is regularly slashed and mown for operational maintenance of the STP.

The access road for the Proposed BEF has been moved away from the constructed wetlands on the eastern boundary of the Site to the north to minimise potential impacts to flora and fauna using these areas of the STP. The revised

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access will be built over an existing gravel road, does not require further clearing of vegetation, and is located internal to the existing STP. This will further reduce the potential impact of vehicle movements and reduce potential disturbance to fauna using the constructed STP wetlands.

The BDAR concluded that construction and operation of the Proposed BEF will not significantly impact or alter the surrounding habitat on STP land or have any significant indirect impacts on the wetlands and associated flora and fauna including migratory and resident bird species. The BDAR has been updated to provide further explanation and details surrounding potential indirect impacts to biodiversity in the vicinity.

4. *Provide guidance on the information required to enable informed decision-making.*

The BDAR has assessed potential indirect impacts to biodiversity. An updated BDAR is included in the RTS to further clarify potential indirect impacts and the mitigation measures that will prevent and minimise those impacts. This report and detailed response provide enough detail to show that a variation to the ecological setbacks for this development is consistent with the objectives of the BDCP 2014.

5. *Ensure that construction and operational impacts of development are avoided and or mitigated using current best practice standards.*

Details have been provided for enhanced construction erosion and runoff controls (over and above standard Blue Book best practices) due to the surrounding sensitive wetlands. Retention and control of up to and including the 100yr storm event on site via a basin is provided with an adequately sized perimeter bund during construction. It is expected that screw pile foundations will be used. This will reduce bulk excavations at depth and the likelihood that any acid sulfate soils or groundwater will be disturbed. In the unlikely event acid sulfate soil is found during excavation, it will be treated within a designated treatment pad area in accordance with the Acid sulphate Soil Management Plan (ASSMP) included in the EIS. All runoff captured during bulk earthworks and ASS treatment will be pumped out for disposal to a suitably licensed facility.

All operations are enclosed in a receival hall that utilises fast opening and closing to allow internal access. Road access to the Facility is now relocated internally to the STP site away from the constructed wetlands to the east of the site. Vehicular traffic will be limited to those as presented in the Traffic and Noise Impact Assessment. Indirect impacts from the Proposed BEF on biodiversity in the constructed wetlands have been assessed in the BDAR accompanying the EIS and further detailed in supplementary analysis provided by the specialist and attached to this report. No indirect impacts to the biodiversity values of the constructed wetlands and associated flora/fauna are expected.

Due to the short duration of construction (approximately 10 months), and proposed enhanced soil and water measures, potential construction impacts can be avoided and managed/mitigated. Operations will be undertaken in line with current best practice, which is enclosed receival and processing of waste.

6. *Provide guidance on acceptable measures to avoid or minimise the impact of proposed development on biodiversity including proposals affected by Part 7 of the Biodiversity Conservation Act 2016 and the Koala Habitat Protection SEPP 2019.*

The BDAR included with the development application provides acceptable mitigation measures for the project. Additional changes to the development footprint have been proposed to further minimise potential indirect impacts to biodiversity values of the constructed wetlands.

7. *Compensate for unavoidable habitat losses in accordance with applicable legislation, or in the absence of such legislation, contemporary best practice.*

Offsets have been assessed in the BDAR prepared for the Facility. These have been prepared in accordance with the requirements of the BC Act and the BAM, and included with the EIS for the project.

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5.4.2. Objectives of B1.2.1 Development Envelope Controls

The following objectives of the development envelope controls taken from Section B1.2.1 of the BDCP 2014 are provided below along with a statement of how the Proposed BEF remains consistent with each objective:

1. *To identify ecologically significant areas (red flags) with the potential to influence the shape and form of a proposed development envelope.*

A BDAR has been completed to assess potential impacts to biodiversity from the Proposed BEF and as a result the development footprint has been updated and mitigation measures proposed to ensure the prevention and minimisation of direct and indirect impacts to biodiversity, particularly the constructed wetland habitat at the Byron STP.

2. *To ensure areas that areas to be retained are adequately protected and or managed to guarantee their long-term ecological viability.*

The existing constructed wetlands will continue to be managed by Byron Shire Council for their role in sewage treatment (water quality treatment and polishing prior to discharge to local waterways) and for associated high biodiversity values. No impacts or changes to this are proposed or expected.

The southern and western boundaries of the development consist of a low retaining wall (approximately 1m) and a fence line that will prevent all access by vehicles or personnel into adjacent areas of high biodiversity value. Only the existing gated access point in the south-east corner of the Proposed BEF/STP grounds will be retained to provide continued small vehicle and personnel access to the constructed wetlands for inspection and STP operational maintenance purposes.

Additional analysis of the effects of noise and light generated by the project has been included in the updated BDAR.

A qualified arborist has confirmed that the BEF design will allow retention of trees and related habitat adjacent to the Proposed BEF boundary.

The proposed stormwater retention and treatment system has been designed by a qualified civil engineer to ensure that the runoff from proposed outdoor impervious areas during the operational phase does not impact on nearby high biodiversity value areas.

3. *To ensure 'no net loss of biodiversity' through the principles of avoiding and minimising development impacts.*

The BDAR prepared for the EIS, and updated to provide further details, includes mitigation and management measures that will assist in avoidance and minimisation of potential impacts from the construction and operation of the Proposed BEF.

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6. Detailed Response to Stakeholder Comments

The following sections provide further details and reference to supporting materials addressing stakeholder comments from the submissions process.

6.1. Impacts to wetland biodiversity

As cited previously, and in reference to Figure 3.1, most of the stakeholder concern surrounded potential impacts from the proposed development to the biodiversity values of the surrounding wetlands. Moving the proposed access road to the BEF has addressed the vast majority of the potential concerns raised.

6.1.1. Proposed site location of the BEF at the Byron STP

The background investigations that led to the Byron STP site being chosen for the proposed development are detailed in section 1.5.1 of the EIS.

In summary, there have been a variety of studies and reports prepared over the last eight years that look at the opportunity of bioenergy production in Byron Shire through various technologies and with various siting options. Early consideration for this project began regionally in 2013 through the Sustain Northern Rivers group.

Byron Shire Council in 2017 commissioned a Biomass Sources and Siting Assessment to identify potentially viable biomass streams in Byron Shire, consider preliminary siting options for a Biomass Hub, and initiate community engagement for the development of social licence for this project.

The six sites that were deemed potentials were as follows:

- Myocum Transfer Station and quarry;
- Brunswick Valley STP;
- Bangalow STP;
- Ocean Shores STP;
- Tyagarah Council/RMS property; and
- Byron STP.

Figure 6.1 illustrates the potential locations for the proposed BEF. Table 6.1 provides the comparison made between all the sites.

BSC commissioned an additional pre-feasibility study in early 2018 to evaluate BEF feedstocks, locations and processing technologies considering Council's objectives and the current bioenergy technology market. The study reviewed three primary bioenergy technology processes, potential Council facility locations and project execution pathways to carry forward to the end goal of a viable BEF.

The Byron Bay STP (BBSTP) and the Brunswick Valley STP (BVSTP) sites were then evaluated and the Byron Bay STP site was identified as the preferred location for the BEF. Principally, the remote location of the BVSTP and its poor access through residential land made it practically impossible for this development, especially when compared to the BBSTP's central Shire location and its existing placement adjacent to the Byron Arts and Industry Estate. A BEF located at the BBSTP would also be beneficial due to a decrease in overall regional transport of biomass waste and is compatible with surrounding land uses.

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Figure 6.1 Potential site locations for the Proposed BEF. (Image source: Google Earth)

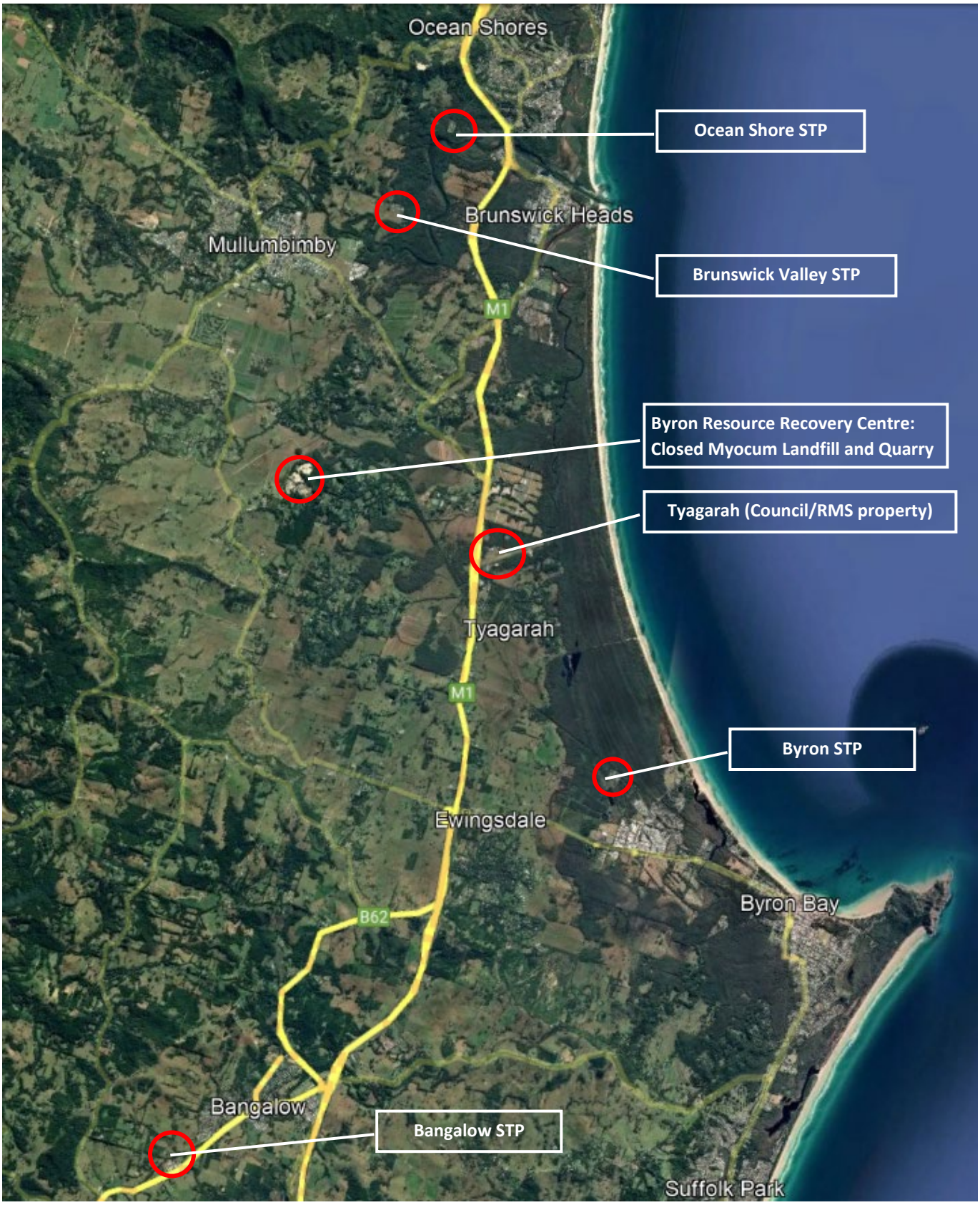

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Table 6.1. Comparison made between potential sites for the proposed BEF. Green is best, yellow is possible, red is not feasible.

Factors for Consideration	Bangalow STP	Brunswick Valley STP	Byron Bay STP	Myocum Quarry and Closed Landfill	Ocean Shores	Tyagarah Airstrip
Access via public roads	Must pass through Bangalow town centre	No safe access off Coolamon Scenic Drive; Vallances Road requires considerable safety upgrades	Yes	Myocum Road from Mullumbimby or M1 Ewingsdale Road Interchange	Brunswick Valley Way M1 Interchange	Gulgan Road/Gray's Lane M1 interchange
Available land located outside 100-y. flood plain?	Yes	No / Low	Yes	Not flood plain, but poor prospects for available land for development	Floodplain has ecological values; poor geotech; requires filling	Requires filling, possible closing of airstrip, or land purchase from Crown
Electrical grid tie-in status	Poor	Good	Good	Poor	Poor	Poor
On-site electrical demand	Low	Moderate	High	Very low	Low	Very low
Central to feedstock supplies	Moderate	Poor	Good	Moderate	Moderate	Moderate
On-site feedstocks e.g. biosolids	Insignificant (Biosolids)	~10% of feed (Biosolids)	~20% of feed (Biosolids)	~10% of feed (Garden Organics)	Insignificant (Biosolids)	None
Acceptable?	No	No	Yes	No	No	No
Summary	– Expensive electrical grid tie-in upgrades – Low on-site energy demand – Low fraction of feedstocks on-site	– Unsafe access – Very little flat land available outside 100-yr flood plain – Not central to feedstocks – Less on-site energy demand	– Public roads – Not in flood plain – Electrical grid tie-in available – Largest Council electrical demand – Central to feedstocks – Approx. 20% of facility feed located on-site	– Poor access – Poor prospects for land availability – Poor grid tie-in conditions – Low energy demand – Not central to feedstocks, except GO	– Operating site for foreseeable future – Poor land conditions in flood plain – Poor grid tie-in conditions – Very low energy demand on-site – Not central to feedstocks	– Operating airstrip on-site – Poor land conditions in flood plain – Poor grid tie-in conditions – Very low/no energy demand on-site – No feedstocks generated on-site

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The Byron Bay STP was the only feasible site for the proposed BEF because of the following attributes and features:

- Central to feedstocks in the Shire and will result in the largest
- Existing public road access.
- Sufficient space available on geotechnically and topographically acceptable land that is not in a flood plain.
- Acceptable Essential Energy grid connection capacity, and sufficient capacity in the on-site transformer and switchboards.
- The BBSTP is the largest electrical user in Council's meters. Supplying the STP electrical demand with 100% renewable energy maximises both: (A) the reduction in GHG emissions (getting close to net-zero carbon emissions) and; (B) the economic value to Council (by replacing grid electricity use).

Prior to commencing the Environmental Impact Statement to seek approval for the facility to be constructed at the BBSTP a Preliminary Environmental Assessment (PEA) and request for Secretary's Environmental Assessment Requirements (SEARs) was prepared. The PEA, completed in March 2020 identified a range of potential constraints, including those associated with the biodiversity values of the neighbouring wetlands, but nothing that would absolutely prevent the proposed development at BBSTP. As a result, BSC chose to proceed with this development application.

As a result of the PEA, detailed ecological assessments were commissioned in the first phase of the EIS (in December 2020) and were used to inform the exact location of the facility within the lot. It was only in December 2020 that some adjacent wetland areas were mapped as having high biodiversity value by the state government, and the biodiversity chapter of the development control plan was updated to include defined setbacks that overlapped with the proposed development footprint. It was only after redesign, further investigations by the project's ecologist, and state and federal biodiversity related approvals, that BSC decided to submit the development application.

During development of this EIS, changes to the Proposed BEF design were introduced to respond to issues raised in the specialist studies, including Biodiversity. Enhancement of the existing internal STP roads as the BEF access road was also considered and will now be adopted to reduce concerns raised by the community during the exhibition period.

6.1.2. Assessment of potential indirect impacts to biodiversity and larger wetlands surrounding the STP

Indirect impacts were assessed in the original BDAR accompanying the EIS, specifically in Section 5 and Section 6 of the BDAR. A thorough suite of impact mitigation measures has been proposed that will address any potential indirect impacts to wetland biodiversity. A summary of these are as follows:

- Operational areas (other than truck turning) are enclosed to minimise noise;
- Blowers and pumps are enclosed in technical corridors to minimise noise
- Access road can be redesigned to run through middle of the STP;
- Low vehicle speed limits will be enforced;
- Quantity of stormwater discharged from the site is no more than current rate of discharge from the mown grass grounds of the STP;
- Stormwater is retained and filtered before being dispersed into adjacent wetland area;
- No leachate will be stored in open dams or discharged from the site (it will all be contained in tanks, reused in the process, and pumped out and disposed of in a licensed facility if absolutely necessary);
- Boundary 'living' fence installed to create a visual and noise screen using local flora;
- No vehicle or personnel movements outside the site boundary fence except through the current wetland access point (SE corner) already used by the community and council staff;
- All trees surrounding the BEF will be retained and protected (as per Arborist report); and

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- Higher building fire rating adopted to avoid clearing asset protection zones.

The BDAR submitted with the EIS identified routes of habitat connectivity between the proposed BEF site and adjoining landscape. The BDAR determined that the proposed BEF is not likely to impact upon any fauna movement or corridors this is because:

- The development is located in a cleared and historically developed site that is already a barrier to fauna movement;
- The finished structure will be similar in height and form to existing infrastructure associated with the existing, operational STP; and
- Existing habitat corridors that surround the Subject Land will continue to exist, unhindered by the proposed development.

It is unlikely there will be any appreciable indirect impacts on biodiversity arising from the development proposal that have not been addressed in the EIS, especially when considering the nature and scale of the proposed development; the character of the site; the historic disturbance and fragmentation, and maintenance of vegetation within the property in conjunction with the proposed impact mitigation measures listed above. Only the direct impacts associated with vegetation clearing and construction of the proposed BEF are expected. Section 5 of this report provides a thorough summary of how the proposed development meets the objectives of Chapter B1 Biodiversity in the Byron DCP, which outlines non-prescriptive and prescriptive measures with regards to maintaining biodiversity values.

The BDAR has been updated (Appendix D) to provide further clarification and justification that no significant indirect impacts are expected due to the proposed BEF.

6.1.3. Referral to Commonwealth under the Environment Protection and Biodiversity Conservation Act 1999.

A referral report was prepared and submitted on 7 June 2021 under the *Commonwealth Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). A decision response was provided on 27 July 2021 that the proposed development is not a controlled action. Section 5.3.5 in this report provides further details.

6.1.4. Internal access road proposed directly adjacent to wetlands

Whilst the BDAR assessed that the proposed access would not significantly affect the surrounding wetland biodiversity values, the access road has been moved to minimise impact.

The access is now proposed to be via the existing entrance to the north of the STP buildings and upgrading the existing internal STP access roads. These are shown in the revised site layout plans provided in Appendix B.

6.1.5. Consideration of other access options

As discussed in the EIS, alternative access was considered, however it was determined not to be feasible.

Existing public roads are proposed for access to the BEF via Ewingsdale Road, Bayshore Drive, Wallum Place and the Byron STP, and have been confirmed in the EIS traffic study to have adequate service capacity for the small increase in vehicle movements forecast for the Proposal.

The following discusses the other theoretical access routes to the Byron Bay STP site that were considered and why they are not feasible.

1. New road across the Cavanbah Centre parking lot and playing fields, across service roads within the Byron Bay STP constructed wetlands, to Wallum Place within the STP site.

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- Disruptive to Cavanbah Centre activities and use, possibly requires repurposing of sports fields for road widening;
- Costly;
- Higher risk to biodiversity due to access through (and close proximity to) wetlands; and
- Destruction of wetland areas for road widening and infilling.

2. New road from M1 Pacific Highway, along Railway Right-of-Way, to Wallum Place within the STP site.
    - Unlikely to be approved due to probability of rail trails conversions. Tweed and Lismore are converting this railway to rail-trails, and it is unlikely that the roadway use would be compatible;
    - Lengthy duration and cost for approvals process, in any event; and
    - Costly construction.
3. New road from Centennial Circuit, across new purchased or expropriated Right-of-Way on undeveloped private land, across service roads within the Byron Bay STP constructed wetlands, to Wallum Place within the STP site
    - Centennial Circuit is far more congested than Bayshore Drive and Wallum Place;
    - Costly construction and land acquisition; lengthy process for purchase or expropriation;
    - Costly and environmentally risky due to road right through wetlands; and
    - Destruction of wetland areas for road widening and infilling.
4. New road from Bayshore Drive, across Lot 12, clearing through Environmental Management zoning, across service roads within the Byron Bay STP constructed wetlands, to Wallum Place within the STP site.
    - Disruptive to Lot 12 concept masterplan;
    - Would require construction of a road through environmentally sensitive/high value land that Council has only recently designated for protection in Lot 12;
    - Environmentally risky due to road right through wetlands; and
    - Very costly requiring infilling of wet areas in the environmental zones.

In summary, and given the above discussions, the existing public roads and the proposed haul route and revised access road provide the most feasible and by far the preferred site access route for the Bioenergy Facility.

6.1.6. Disturbance impacts to wetland fauna from additional traffic during construction and operation

As discussed in the EIS, the proposed BEF is expected to include 3 to 5 staff accessing the site per day and 10 deliveries per day, with a maximum of 2 trucks onsite at any one time. While preparing the response to technical questions on traffic noise raised by EPA a more accurate calculation was made resulting in a revision to 8 deliveries (truck movements) per day. There will be a maximum of 7 operational vehicle movements (5 staff and 2 truck movements) during the road network peak periods.

The proposal will replace the truck movements associated with the removal of biosolids (currently requiring approximately 45 truck movements over a 2-3 day period, occurring at six-week intervals). The biosolids will be processed onsite through the composting facility, being used for energy production.

Construction is expected to be undertaken over a period of 10 months. An average of 6-8 truck movements per day (including all deliveries of equipment and materials) are expected during construction of the proposed facility.

In summary, the BDAR assessed that even with additional haul truck movements during construction and operation, the effects upon waterbirds will be insignificant because:

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1. The vehicles will be travelling at slow designated speeds, thus chance of collision with birds will be extremely low;
2. Vehicles will be travelling on designated roads which threatened birds are not likely to inhabit; and
3. Motor vehicles including light vehicles, and large vehicles evoke shorter flight-initiation distances (FID) than humans on foot (Mcleod et al 2013). A study by Pease et al (2005) exposed seven species of dabbling ducks experimentally to walking, biking, a slow truck and a fast truck. Pedestrian and cyclists caused the highest proportion of dabbling ducks to flush relative to automobiles.

Appropriate impact mitigation measures will be adopted to address the impacts of vehicle movements prior, during and post construction, and during the operational phase of the project. This includes:

- Enforcing low-speed limits as detailed in the additional mitigation measures (see Table 8.1);
- Installing signage to warn drivers of the presence of wildlife crossing roads; and
- Educating drivers and operators of the wildlife, in particular wetland birds that are present in the landscape.

6.1.7. Disturbance impacts to wetland fauna from noise and lights during construction and operation

The effects of traffic noise on birds is complex, and opinions in the scientific literature vary. While it usually assumed that noise associated with traffic including heavy vehicle operation could increase disturbance to birds, multiple studies have shown that it is not the noise from traffic that significantly effects bird presence, breeding and behaviour, but other effects, most noticeably vehicle collision (Summers et al 2011). As discussed, vehicle collision risk can be significantly reduced or avoided by enforcing slow speed limits by vehicles traversing the facility.

The effects of noise from heavy vehicle movement can be significantly mitigated, by enforcing maximum speed limits and stringent rules to reduce heavy vehicle noise emission such as implementing bans upon (or enforcing minimisation) the emission of compression ('jake') and exhaust brake noise from heavy vehicles when such vehicles pass wetland bird habitat areas. Owing to the topography of the site it is not likely that exhaust /compression breaking will be require at all. Other mitigation measures include ensuring trucks have rubber-lined trays (or similar noise reducing measures) and vehicles only tip waste products indoors.

Tipping of materials will not likely generate noise that will disturb threatened fauna as the tipping will incur indoors and the materials being tipped consist of organics which make no abrupt or sharp noise when tipped onto a hard surface.

Noise from the fans and pumps associated with the Bioenergy Facility (BEF) will be minimal as noise mitigation measures will be put in place, for example, wherever possible such noise-emitting plant will be enclosed within a noise attenuated building.

6.1.8. BEF impacts on biodiversity values and associated impacts to recreation and tourism

These constructed wetlands form part of the 100 ha Byron Bay Integrated Water Management Reserve. An award-winning example of how good resource management can minimise the impact of the sewage treatment plant on the surrounding ecosystems and create a wonderful, natural habitat for the support of local flora and fauna diversity.

The wetlands are a great place to bird watch when visiting Byron with more than 227 species spotted. Habitats and seasons will define where you are likely to see the birds and a variety of water levels provide for different types of waterbirds and shorebirds.

Bookings can be made for the Wetlands Interpretive Centre, located about 320m south east of the BEF site. The facility provides a meeting room, disabled access and toilet and first aid kit as well as a small kitchen. The Wetland Interpretive

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Centre is air-conditioned and will accommodate up to 30 people comfortably and provides a place for school and other groups to gather and learn about the construction wetlands and biodiversity values of the wetlands and region.

Access to the facility is from Wallum Place and is completely separate to the STP including a separate parking area for visitors adjacent to the centre. Use of the facility will not be impacted by the BEF. The proposed location of the BEF adjacent to the STP will not block or impede any uses of the Wetlands Interpretive Centre.

None of the existing walking tracks around the constructed wetlands will be impacted which can continue to be used by visitors and tourists during both construction and operation of the proposed BEF. During construction of the proposed BEF there may be additional noise and disturbance for a short period of time, however access will not be impacted as the construction fencing will be placed such that access around the ponds adjacent to the wetlands can still be maintained.

Once operation of the facility begins, there will be vegetative screening and fencing along the southern edge of the proposed BEF, but foot traffic access around the wetland areas will remain intact and open.

6.2. Consultation with local community organisations

A social impact assessment report was prepared and accompanied the EIS and development application to assess potential social impacts. BSC prepared a Communication and Engagement Plan (CEP) for the proposed development in November 2020, which supported the delivery of the social impact assessment for the project.

Feedback was sought from neighbours comprising residents and business owners / operators from a wide consultation area, within a 1km radius of the development (169 property owners).

In addition, the following businesses and community groups were contacted:

- Habitat retail precinct;
- Elements Resort;
- West Byron Fair shopping centre (IGA and other businesses);
- Bayshore Drive and Centennial Circuit businesses;
- Other Arts and Industry Estate businesses;
- North East Forest Alliance;
- Belongil Catchment Drainage Board;
- Byron Environment Centre; and
- Community Alliance for Byron Shire (CABS).

A letter of introduction to the project was mailed to these groups, along with a supporting information sheet. The focus was to seek feedback from neighbours on key matters that need consideration in the environmental assessment phase of the project. The community outreach encouraged respondents to provide feedback via Council's 'Have Your Say' web page.

A summary of issues was provided in the EIS along with the steps taken during the EIS process and design development stages to address stakeholder concerns. These are provided in section 4 of the EIS, and summarised in table 4.1 and table 4.2 of the EIS. The public exhibition period is also an important part of the consultation process and, as demonstrated by this report, allows submissions that informed by the full development application to be considered and addressed by the proponent, which in this case is BSC.

Additional community outreach has been undertaken by BSC post exhibition of the EIS. These activities are summarised in Section 7.2 of this report.

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6.3. Business case and project investment

The Global Decarbonisation team at Deloitte Australia conducted financial modelling for the proposed BEF project. The modelling was conducted on a business case applying the following fair, responsible, and conservative assumptions:

- No increase in Council rates, charges, or levies in order to support or subsidise this project;
- Actual FY2022 Council organic waste management costs;
- Actual FY2022 electricity retail costs;
- Treasury NSW forecast municipal finance lending terms for interest rates and loan duration;
- Higher than average discount rates, to conservatively estimate the project NPV; and
- CPI escalation for costs and fees.

Using the above-noted conservative business case assumptions and actual Council operating costs, the proposed project is forecast to carry its own operational costs and service its own debt with no external support from the Council funds. Moreover, there are many other significant benefits to this project, which include for example:

- GHG emission reductions from multiple points;
- Taking the Byron Bay STP off grid energy, and the grid export of excess renewable energy generated;
- Taking organic waste transport trucks off road by keeping the waste processing local;
- Diverting organic waste from landfilling;
- Generation of a local compost product for regional farmers and residents; and
- Providing an Australian first demonstration reference site for other Shires and Developers to replicate across the nation for organic waste diversion from landfill, generate renewable energy and a high-quality compost for improving soil quality.

The Bioenergy Facility represents an economically sound and leadership-driven project.

6.4. Future growth of Industrial Estate Amenity

The Northern Regional Planning Panel (NRPP) requested further information to demonstrate what effect the Bioenergy Facility might have on the build-out of the Industrial Estate amenities (e.g. noise, odour, visual and traffic). The following three Industrial Estate developments have the potential to be affected by the Bioenergy Facility and are discussed further below.

Figure 6.2 shows several lots (in red) that are planned or have potential for development in the near future. The area outlined in green will be retained by BSC because of its high environmental values.

Habitat Stage 5 is planned for inside the envelope of existing development which has already been assessed in terms of potential traffic, noise and visual impacts. Habitat Stage 5 does not push further west, therefore no additional impacts are expected.

The future development site along Bayshore Drive and Parkes Avenue (Habitat internal roadway) is, again, no further west than the existing Habitat development that has already been assessed, and found that no significant impacts due to the proposed BEF are expected.

The potential future development site along Centennial would not be impacted by the proposed BEF because the constructed wetlands and conservation lands between this site and the Byron STP/proposed BEF will remain intact and provides a buffer. No additional impacts outside of those already assessed in the EIS are expected.

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Figure 6.2. Future potential development sites near

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6.5. Other Environmental and Community Concerns

6.5.1. Air quality impacts from vehicles and BEF plant emissions

An air quality impact assessment (AQIA) prepared as part of the EIS assessed potential air quality impacts on the nearest sensitive receptors from construction and operation of the proposed BEF. The AQIA has been reviewed by the NSW EPA who subsequently issued their General Terms of Approval (GTA), which is a conditional approval from this consent authority.

In addition to the proposed biofilter, contingency mitigation measures have been proposed should odour issues persistently occur. If increased dispersion of the treated air is required (to further reduce impact on neighbours) the biofilter can be retrofitted with a cover and a chimney (stack). Whilst ammonia levels for the exhaust air are anticipated to be low given the size of the biofilter (440 m2) and the inclusion of a water scrubber in the design, the system could be retrofitted with an acid scrubber to remove ammonia from the air stream prior to the biofilter if ammonia levels are higher in the exhaust air than expected.

With the implementation of the air quality mitigation and management measures provided in the EIS, the proposed BEF is expected to comply with all applicable legislation and guidelines with respect to potential air quality impacts and is therefore suitable for construction and operation.

Vehicles will be licensed to operate in NSW with either State of Commonwealth registrations. As such, by law they must comply with vehicle emission standards and are not forecast to have significant impacts on local air quality. Transport for NSW and Byron Shire Council reviewers accept that the public roads have capacity for the small number of proposed vehicle movements from this development; additional study on this matter is unwarranted.

6.5.2. Traffic impacts to the community

A Traffic and Transport Impact Assessment prepared for the EIS assessed the potential impacts from traffic generated from the construction and operation of the proposed BEF on the local road network.

Construction is expected to be undertaken over a period of 10 months. An average of 6-8 truck movements per day (including all deliveries of equipment and materials) are expected during construction of the proposed facility. These movements will primarily be related to delivery of materials and movements on-site for a short-term period. Some light vehicles for construction workers travelling to and from the Site are also expected. Overall, the traffic volumes associated with construction of the BEF are expected to be lower than the operational traffic volumes. Therefore, construction traffic is unlikely to impact the surrounding road network.

As mentioned previously, during operations, 3 to 5 staff and 8 deliveries are expected to access the site per day, with a maximum of 2 trucks onsite at any one time. The 8 heavy vehicle movements consist of up to 5 side lift compactor trucks (from food and garden organics kerbside collections) and 3 bulk materials trucks (maximum length 19m) which deliver bulked up organic wastes from other facilities (e.g. Byron Resource Recovery Centre) and collect finished compost. These vehicle movements are in addition to those currently required for STP operation. With a maximum of 7 vehicle movements (5 staff and 2 truck movements) occurring during peak periods on the roads, the assessment determined that the proposal will not have any unacceptable impacts on the road network.

The proposal will replace the truck movements associated with the removal of biosolids (currently requiring approximately 45 truck movements over a 2-3 day period, occurring at six-week intervals). The biosolids will be processed onsite through the BEF. The benefit of these reduced biosolids truck movements are not counted in the forecast traffic for the development.

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To calculate the traffic noise impacts generated by the operation of the development the existing road traffic volumes for Wallum Place and Bayshore Drive (nearest impacted roads) are required. The increase in traffic volumes due to proposed operation of the site are shown in Table 6.2, which also summarises the predicted increase in noise levels on the nearest affected roads due to the traffic generated by the proposed development site.

Table 6.2 Summary of Traffic Noise Increases on Surrounding Roads (from available traffic data).

Volume per Day	Existing Traffic Volume per Day	Percentage Heavy Vehicles %	Increase in Traffic (due to the proposed BEF) Volume per Day	Percentage Heavy Vehicles %	Increase in Noise Levels dB
Wallum Place (between Bayshore Drive and Porter Street)	4,300[1]	10[2]	4,326	10	0.1
Porter Street	2,448[3]	10	2,448	10	0.0
Wallum Place (between Porter and Gallagher Drive)	2,072	10	2,098	11	0.3
Gallagher Drive	1,632[4]	10	1,632	10	0.0
Wallum Place (between Gallagher Place and BBSTP)	220[5]	12	246	17	1.4
Bayshore Drive	27,500[1]	10[2]	27,526	10	<0.1

Note:
1. As per Rytenskild report peak hourly data with a conservative x10 factor to convert to estimated daily volumes.
2. Conservative estimate based on traffic mix observations during site survey.
3. Estimated 60% of traffic which enters the Habitat Shopping and Lifestyle Precinct routes from Wallum Place onto Porter Street.
4. Estimated 40% of traffic which enters the Habitat Shopping and Lifestyle Precinct routes from Wallum Place onto Gallagher Street.
5. Traffic data averaged from 1 week of security camera footage at the existing Byron Bay Sewage Treatment Plant (BBSTP).

With the implementation of the traffic mitigation and management measures provided in the EIS, the proposed BEF is expected to comply with all applicable legislation and guidelines with respect to potential traffic impacts and is therefore suitable for construction and operation.

6.5.3. Noise impacts to the community

A Noise and Vibration Impact Assessment (NVIA) was prepared for the EIS to assess the potential noise and vibration impacts associated with the construction and operation of the proposed BEF on any nearby sensitive receptors.

The facility has been designed to minimise noise emissions by enclosing noisy equipment with technical corridors and siting noisy equipment on the side of the facility furthest from residential sensitive receivers. A selection of the predicted worst-case operational noise levels due to onsite noise sources show low noise emissions from the site to the surrounding environment when the proposed mechanical noise control measures are implemented.

Given the relatively small increase in vehicle traffic to be caused by operation of the proposed development, the predicted noise increase associated with construction and operational vehicle movements is expected to be less than 0.1 dB along Wallum Place, the increase in noise levels is predicted to be 0.3 dB between Porter Street and Gallagher Drive, and 1.4 dB between Gallagher Place and the proposed BEF site. These predictions satisfy the Road Noise Policy criteria that traffic associated with a project must not result in an increase of more than 2 decibels (dB).

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With the implementation of the mitigation measures as described in the EIS, the proposed BEF is not expected to have significant noise and vibration impacts and is therefore suitable for construction and operation.

6.5.4. Greenhouse gases

Council staff from the Infrastructure Services Directorate and the Sustainable Environment and Economy Directorate collaborated to prepare a detailed account of atmospheric greenhouse gas (GHG) emissions calculated from present/business-as-usual operations, versus the estimated GHG emissions form an operational Bioenergy Facility.

The accounting was performed in equivalent tonnes of carbon dioxide emissions per year (t-CO_2-e/year), and included all emissions from transport fuel, electricity consumption (or production as is the case for a Bioenergy Facility), as well as fugitive emissions from landfilling, anaerobic digestion, and composting. CO_2 refers to carbon dioxide, while CO2e stands for "Carbon Dioxide Equivalent" which includes CO_2 and other greenhouse gases (e.g. methane, nitrous oxide, and ozone). Carbon dioxide equivalent, or CO_2e, includes other greenhouse gas emissions expressed in terms of CO_2 based on their relative global warming potential.

The results are presented in Table 6.3. As can be seen, and using best available Australian Commonwealth policy guidance, the Council Infrastructure Services and Sustainable Environment and Economy staff have determined that the Bioenergy Facility is forecast to result in an atmospheric carbon emission reduction of over 9,000 tonnes CO_2e/year.

Table 6.3. Greenhouse gas (GHG) emissions calculated from present/business-as-usual operations compared with an operational Bioenergy Facility

Emissions Source	GHG Emissions Business As Usual FY2021 (tonnes CO_2-e/year)	GHG Emissions Bioenergy Facility Operational FY2021 Reference (tonnes CO_2-e/year)
Grid electricity	851	-1,661
Other LGA's FOGO and GO Composting	248	24
Byron FOGO Composting	616	94
Byron GO Composting	161	8
Waste FOG Cake	53	1
Commercial Food Waste to Landfill	5,670	0
Total	**7,598**	**0**
Relative GHG Emissions Reduction with Operational Bioenergy Facility		**-9,132**

6.5.5. Safety and explosion risks from gas storage

The biogas tank sits directly above the anaerobic digestor tunnels and is located greater than 30m from the STP oxidation ponds and other STP infrastructure. The biogas is greater than 40m from the access road and approximately 250m from the entrance to the STP. Sensitive uses fall outside of the 40m threshold.

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The biogas storage amount and location are below the Class 2.1 thresholds set forth in *Figure 6: Class 2.1 Flammable Gases Pressurised (Excluding LPG)* in the *Hazardous and Offensive SEPP and in this case* the proposed development is not considered a potentially hazardous development.

A Bushfire Assessment and, whilst not required for the EIS, a Fire Safety Study were also prepared to assist with design of the proposal. The mitigation measures as proposed in the EIS are considered appropriate to manage health and safety of proposed BEF staff, the community and the environment. Note that the BEF design includes connection to mains water and a large on-site roof water tank. As indicated in the EIS, a roof-top sprinkler system will protect the Biogas Storage Dome from ember attack.

The BEF has adopted construction materials and methods suitable for the BAL flame zone that overlaps part of the site. In addition, a 6-metre-wide access has been designed around the entire facility for operational and emergency service personnel access and egress. These measures will protect both the building and its occupants from potential exposure to bush fire. The Biogas Storage Dome (Biodome) was also moved entirely into the lower Bushfire Attack Level (BAL) 12.5 zone i.e. it is not in the flame zone.

The BEF incorporates an essential flare in its design. The flame is permanently contained within an insulated chimney.

The updated BDAR assessed the potential for the flare to impact on fauna (i.e. birdlife). As chimney is insulated and no open flame and no heat at the surface of the flare, there is little to no risk of fire in adjacent areas and little to no risk to birds that fly over the chimney or attempt to perch upon it. Bird deterrent spikes or equivalent structures could be installed on the horizontal surfaces of the chimney, if it was apparent that birds attempted to perch on the chimney. In the unlikely event this issue came apparent, it would be easily managed through minor engineering of bird deterrents onto the chimney.

6.5.6. Height exceedance

A Landscape and Visual Impact Assessment (LVIA) and Landscape Concept Plan was prepared for the proposed BEF and included with the EIS and development application. The LVIA details the results of field work, documents the assessment of the existing landscape character and visual setting, and assesses potential visual impacts associated with the proposed BEF. The LVIA also discusses measures to assist in the mitigation of potential visual impacts and ensure that the character of the immediate area and surrounding visual landscape is not overly modified or diminished.

The EIS determined that with the implementation of the recommended mitigation measures development of the proposed BEF can be undertaken whilst maintaining the core landscape character of the area, with minimal visual impact on the surrounding visual landscape.

It was also determined that the proposed building has a maximum building height of 13.57 m (measured from the lowest existing ground level on the site), which is 4.57 m above the maximum building height permitted for the site by Clause 4.3 (Height of Buildings) of Byron Local Environmental Plan (BLEP2014). An elevation view of the proposed BEF is provided in Figure 6.3, and demonstrates that the proposed BEF building height is generally congruent with the existing processing units and buildings at the BBSTP.

A request for exception to the building height limit was submitted along with the EIS and development application. Having regard to the facts and circumstances outlined in this objection, it is considered that the consent authority can be satisfied that the matters in Clause 4.6 of BLEP2014 (Exceptions to Development Standards) have been adequately addressed.

In addition, the consent authority can reasonably be satisfied that the proposed development will be in the public interest because it is not inconsistent with the objectives of the building height development standard or the zone objectives. The erection of a publicly owned building that is fit for purpose as a bioenergy facility is in the public interest.

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Clause 4.6 (4) (b) provides that development consent can only be granted with the concurrence of the Secretary of the Department of Planning and Environment. The Northern Regional Planning Panel has delegated authority to assume the Secretary's concurrence.

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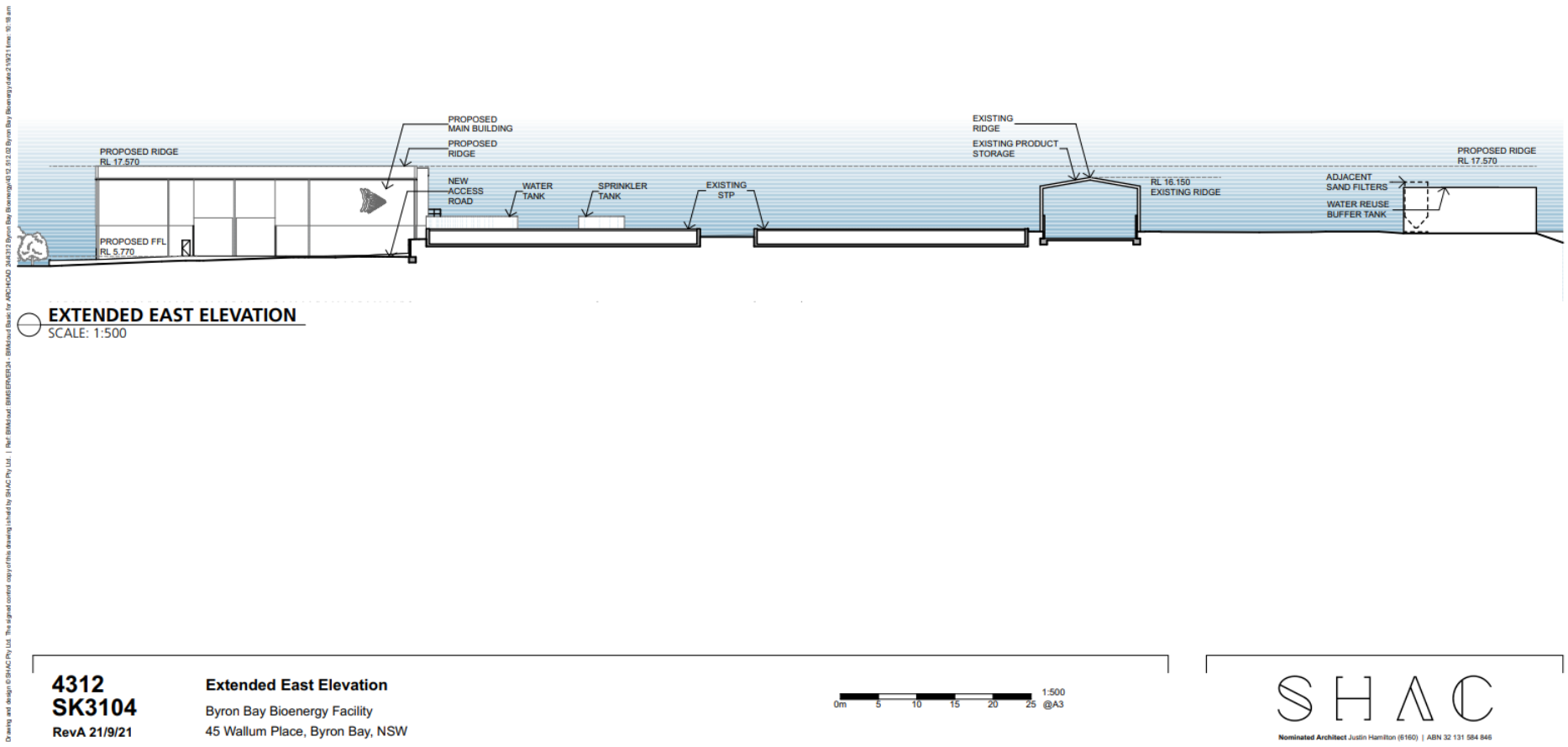
Figure 6.3. Elevation view of the proposed BEF.



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7. Post Exhibition Actions

7.1. Additional Impact Assessments

As provided for in Appendix D of this report, the BDAR for the proposed BEF has been updated with further discussion surrounding potential indirect impacts to wetland biodiversity values. This additional assessment has confirmed and concluded that it is highly unlikely that the proposed BEF would have any significant indirect impacts to the biodiversity values generally and to the STP wetland biodiversity values specifically.

7.2. Further Community Engagement

In addition to the Social Impact Assessment (SIA) conducted as part of the EIS for the development application, below is an update of additional communications and stakeholder engagement pre- and post-exhibition of the EIS. Byron Shire Council has participated in the 2016 public meetings regarding bioenergy and Council lead the public open house for this particular project in 2018. Since October 2020, Council's Bioenergy Facility project team have conducted a broad and extensive communications and stakeholder engagement campaign, which will continue throughout the project lifecycle and into operations subject to the DA determination.

Major stakeholders were identified and mapped in an initial Communications and Stakeholder Engagement Plan in September 2020. This was in consultation with Utilities, Media and Communications, and the Sustainable Environment & Economy (SEE) teams. The Plan was endorsed by Council Executive Management Team (ET) and reported to Council's Communications Panel. This Plan is a live document and has been adapted as needed in response to Council and community needs.

The level of engagement for the general community was at a 'consult' level. At a 'consult' level Council keeps the community informed, listens, acknowledges concerns, and provides feedback on how public input influenced the decision. Communication activities have been a combined approach of targeted activities for specific stakeholders to improve depth of understanding, and broad messaging and media channels to maximise audience reach and promote awareness and inclusiveness.

Specific activities have included the following:

- **General**
  - Media releases – at launch, community survey stage and DA public exhibition stage, distributed nationally to cover all media channels.
- **Online**
  - Council webpage - general information and a link to the Your Say page. Bioenergy Facility - Byron Shire Council (nsw.gov.au);
  - Your Say webpage - extensive and up to date information, downloadable facts sheets, reports, videos, infographics, direct contact details for the project team members;
  - 2-way engagement opportunities such as Q&As, community survey and submissions portal. Byron Shire Bioenergy Facility | Your Say Byron Shire;
  - Social media – Council's Facebook and Instagram accounts have been used since October 2020 to promote the launch of the Your Say project page, prompt the community to learn more about the project via the Q&A tool, promote Council's attendance at the local Framer's Markets, promote the community survey and EIS submissions process and promote the public exhibition of the DA. Facebook chats have also been monitored and responses provided online to community members. Byron Shire Council | Facebook and Byron Shire Council (@byronshirecouncil); Instagram photos and videos;

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  - Council e-News – various short news stories promoting the project, with prompt to YourSay. Emailed directly to all ratepayers and subscribers;
  - Community surveys; and
  - Media interviews – featured in online news sites such as Courier Mail, Daily Telegraph, Northern Star, Byron Shire News, Byron Echo-net, Gold Coast Bulletin, Channel 9 News online, ABC News, and online industry publications.
  - Broader Council documents (e.g., policies and budget announcements, Council Meeting minutes available to the public on Council's website)
- **Print**
  - Fact sheets – 2x 4-page fact sheets with general information and FAQs. Downloadable from webpages, mailed out to neighbouring properties, handed out at local markets, available at Council Chambers Customer Service desk, provided to community groups for distribution;
  - Advertisements – multiple advertisements placed in local print newspaper, Byron Echo, at launch, community markets and DA stages;
  - Media interviews – multiple news stories in Byron Echo and the Northern Star print newspapers; and
  - Something to Talk About – news story in Council's annual print journal, distributed to Shire residents via letterbox drop (January 2021).
- **Radio**
  - Media interviews – Bay FM, 2LM/ZZZ, ABC North Coast and Radio National stations TV; and
  - Media stories - Prime 7 and Channel 9 regional free-to-air TV stations have featured the project on their news programs.
- **Direct Mail**
  - Mail out - personalised letters and fact sheets were mailed out to government agencies, key community groups and neighbouring properties to promote the Environmental Impact Studies at the Social Impact Assessment stage; and
  - Community survey – emailed to Council's Citizen Lottery (400 registered participants).
- **Face to face**
  - Site tours conducted at launch with local media and North East Forest Alliance, and during feasibility stage with Arakwal members and Habitat Executive team;
  - Byron Bird Buddies (2x on-site meetings held: during public exhibition stage and post receipt of SIA submission);
  - Habitat – Follow-up meeting with Executive team after site tour, and community meeting with residents and strata holders with PM presentation;
  - Elements – meeting with Elements Executive team and members of Sustainability Committee;
  - Farm Liaison Officer – briefing for field visits to agricultural community, provided with promotional material for hand out; and
  - Restaurant and café community – informal awareness building through project team's local network and contacts, organic word of mouth promotion among industry.
- **Events**
  - Farmers Markets – 3x markets over launch and community survey periods at Byron Bay Cavanbah Centre. Fielded questions from locals, hand-outs, prompt to Your Say webpage; and
  - Zero Emissions Byron – distribution of facts sheets on behalf of Council at pop-up stands around the region
  - Preparation of Mayoral presentations at industry events.
- **Other**
  - Direct email correspondence - with community members with requests for information;
  - SPW workshops - with Councillors; and
  - ET and Council meetings – Project Manager presentations, regular reporting.

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Council also voluntarily extended the DA Public Exhibition period by a fortnight. Since the close of the DA Public Exhibition period, the Council project team has also conducted the following additional activities:

- Numerous direct email correspondence with the media and Shire residents
- Continuous updating of Q&A on the Your Say page
- Direct email follow-up in October 2021 with key community and environmental groups offering to meet with the Council Project Team while it is preparing this report.
- Nov. 2021: Face-to-face meetings with the Byron Bird Buddies, and scheduled for another follow-up meeting once this report is in the public domain.
- Dec. 2021: Face-to-face meetings with neighbouring residents to better understand their concerns and offering to meet again for another follow-up meeting once this report is in the public domain.

7.3. Design Changes to the Updated Project

To summarise, the final site layout plans include the following change post exhibition of the EIS:

- Relocation of the access road to the existing entrance north of the STP buildings and upgrade the existing internal STP access roads.

Figure 7.1 shows the revised layout plans.

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Figure 7.1. Final Revised Site Layout Plans.

Date	Revision	Drawn By	Site description	Jackson Environment and Planning Pty Ltd Strategy | Infrastructure | Compliance | Procurement A: Suite 102, Level 1, 25-29 Berry St, North Sydney NSW 2060 E: admin@jacksonenvironment.com.au T: 02 8056 1849 W: http://www.jacksonenvironment.com.au		Client	Byron Shire Council
10/05/21	Revision A	E. Larson	45 Wallum Place, Byron Bay			Project	Byron Bioenergy Facility
28/06/21	Revision B	A. Johnston				Title	Site Plan Byron BEF
						Scale	Not to scale
						Source	SHAC

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8. Conclusion

Byron Shire Council is seeking approval of the development application for a resource recovery facility (anaerobic digestion and composting) and associated electricity generation works at 45 Wallum Place, Byron Bay (Lot 2 DP 706286).

BSC proposed to construct and operate a best practice Bioenergy Facility (BEF) that can receive and process up to 28,000 tonnes per year of organic wastes from local communities and biosolids from the Byron Bay Sewage Treatment Plant (BBSTP). During operation, the BEF will capture biogas (the result of organic waste processing) and generate sustainable energy for use at the BBSTP and the BEF itself. It will also produce various soil amendments suitable for use in landscaping and agricultural production.

This Response to Submissions Report has been prepared to address feedback received during the EIS exhibition period and provides further information as required. Implementation of mitigation measures as outlined in the original EIS and those additional mitigation measures outlined in Table 8.1 will ensure that environmental impacts will be minimised or avoided in relation to the proposal.

Table 8.1. Additional mitigation measures and changes proposed.

Measure	Description
RTS-1	Speed limits will be enforced and signage will be erected to warn vehicle operators of wildlife. Speed limits for trucks will include the following:
RTS-2	40Km/hr on Wallum Place;
RTS-3	20km/hr on STP internal access road; and
RTS-4	10km/hr in truck turning area and receival hall.
RTS-5	The access road will be relocated to the existing entrance north of the STP buildings and via upgrade to the existing internal STP access roads;
RTS-6	Part of the fencing installed near the BEF will incorporate local provenance native flora species (i.e. native vines) to reduce aesthetic impacts of the BEF and promote habitat for birds, frogs and Mitchells Rainforest Snail.
RTS-7	Lighting will be turned-off at night when the site is not occupied. Vehicle noise will be managed by enforcing slow speed limits, avoiding break noise, and ensuring the tipping of materials occurs in an enclosed area (in-doors).
RTS-8	If BSC is notified of any threatened bird species breeding activity near the development site (e.g. Comb-crested Jacana at H-cell), BSC will engage a suitably qualified person to advise the best course of action to reduce potential for indirect impacts;
RTS-9	In lieu of biodiversity offset credits, Council will fund biodiversity conservation actions in the constructed wetlands that form part of the BBSTP sewage treatment works, and in consultation with local environmental groups;
RTS-10	An acid sulfate soil (ASS) treatment pad size and location, including retention on site of a 100yr storm event, is now noted in the updated construction soil and water management plan (CSWMP) prepared by MPC (Appendix F).
RTS-11	An updated Acid sulphate Soil Management Plan (ASSMP) (Appendix G) provides details of the treatment methodology. Any contaminated water found during construction will be captured and retained on-site, pumped out and disposed of to a suitably licensed facility;

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Measure	Description
RTS-12	No light or heavy vehicle movements relating to the BEF will occur prior 7 am or after 5pm;
RTS-13	The following community noise mitigation will also be implemented: • Noise mitigation measures will be discussed on-site with construction workers over pre-start toolbox; • Prior to and during construction, outreach to potentially impacted residents will be undertaken to clearly explain the forecast duration of the planned works; • If there are complaints concerning noise once construction has started, the potential issue will be discussed with the foreman and plant operators, the source of the potentially offending noise identified, and other reasonable and feasible options for mitigation identified and implemented (e.g., potential respite or alternating/modified equipment usage); • A copy of the complaints register will be kept on site;
RTS-14	In the highly unlikely event that odour emissions become persistently problematic, we will: • Contemplate installing an industrial air curtain; • Increase the number of air changes per hour in the receival hall; and • If the increased airflow through the biofilter causes odour issues we will implement the biofilter contingency measures already proposed in Table 6.5 of the EIS.

No significant impacts to biodiversity or other community and environmental values are expected to result from the approval of this important project. The proposal development is therefore recommended for approval.

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Appendix A – Site Layout Plans (As Submitted with the EIS and Development Application)

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Development Application

Byron Bay Bioenergy Facility

Construction of a best practice Bioenergy Facility
for Byron Bay Shire Council

REVISION A

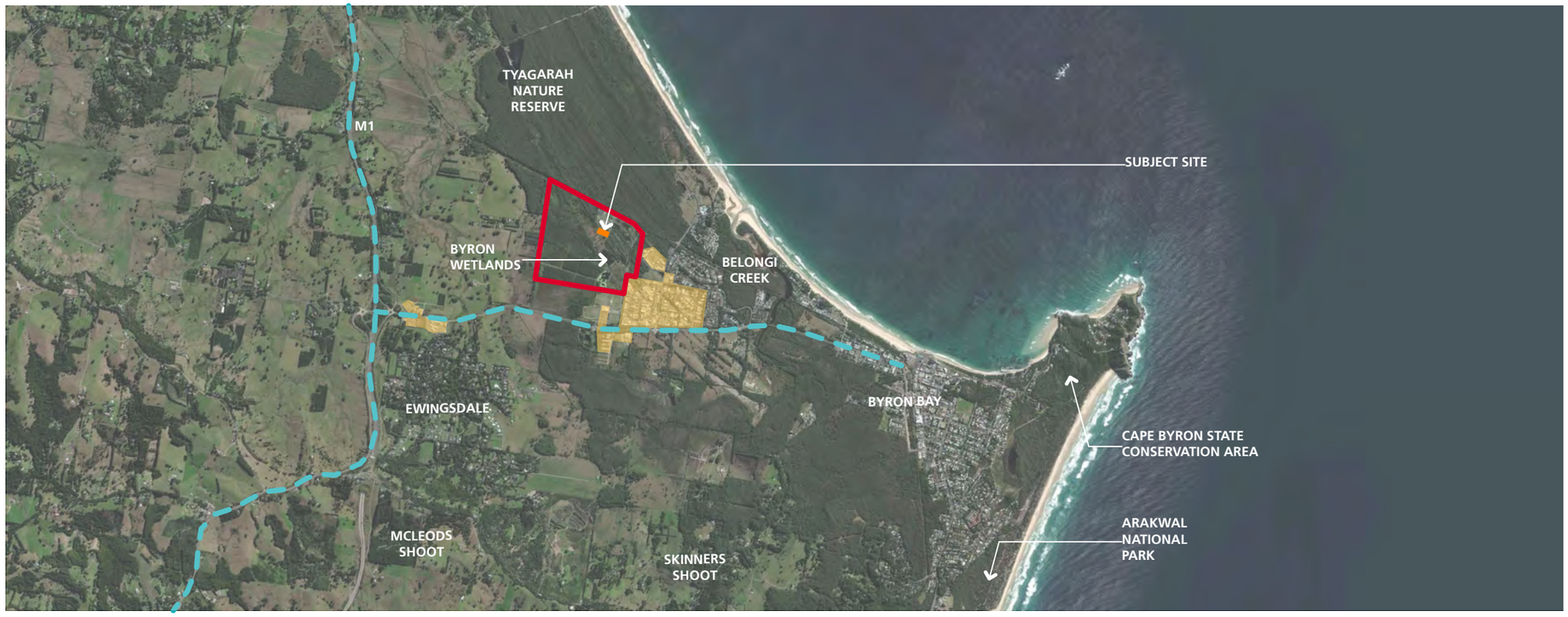
SITE
45 Wallum Place, Byron Bay, NSW
Lot 2, DP706286

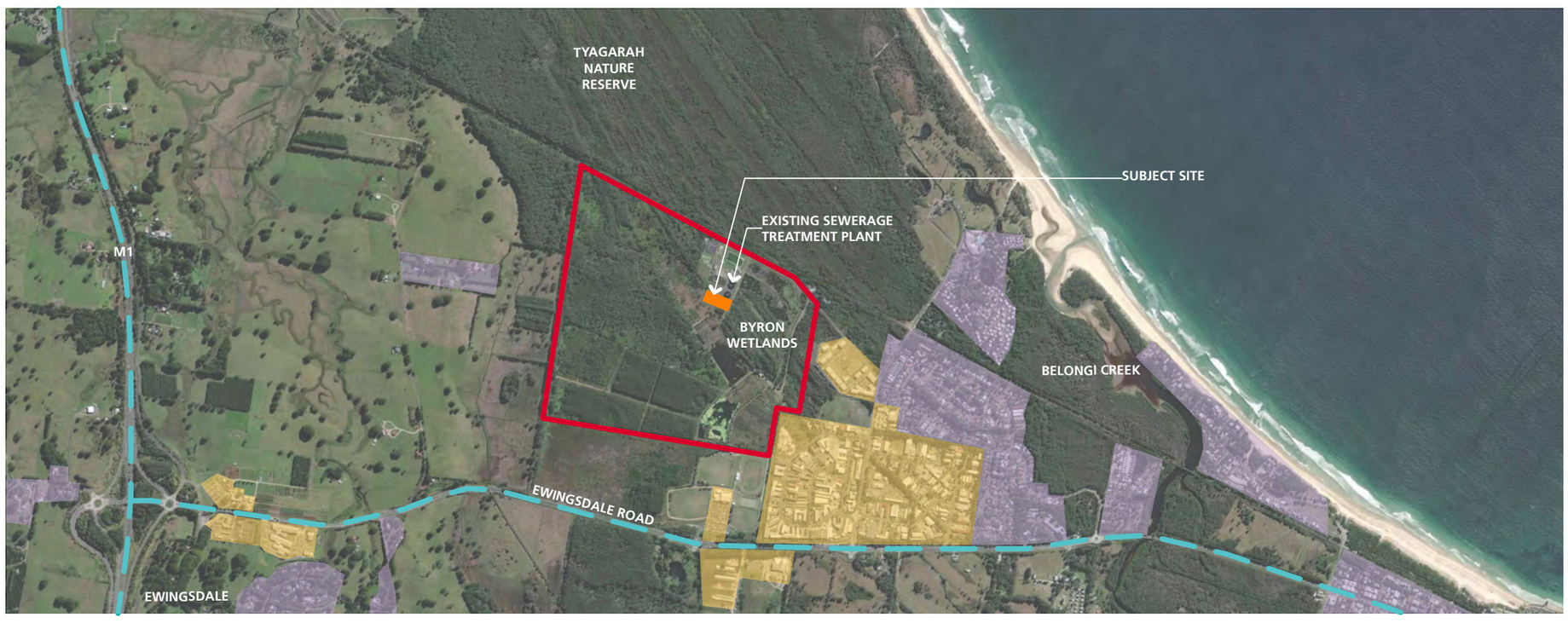
CLIENT
SKALA

DATE
30.04.21

PROJECT NO.
4312

SHAC





PRELIMINARY

1. Dimensions are in millimetres unless otherwise shown.
2. Work to given dimensions. Do not scale from drawing.
3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

LEGEND

- SUBJECT SITE
- RESIDENTIAL AREAS
- COMMERCIAL AREAS
- LOT BOUNDARY
- MAJOR ROADS

4312
SK1010
RevA 30/4/21

Location & Context Analysis

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

NTS
@A3

SHAC

Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

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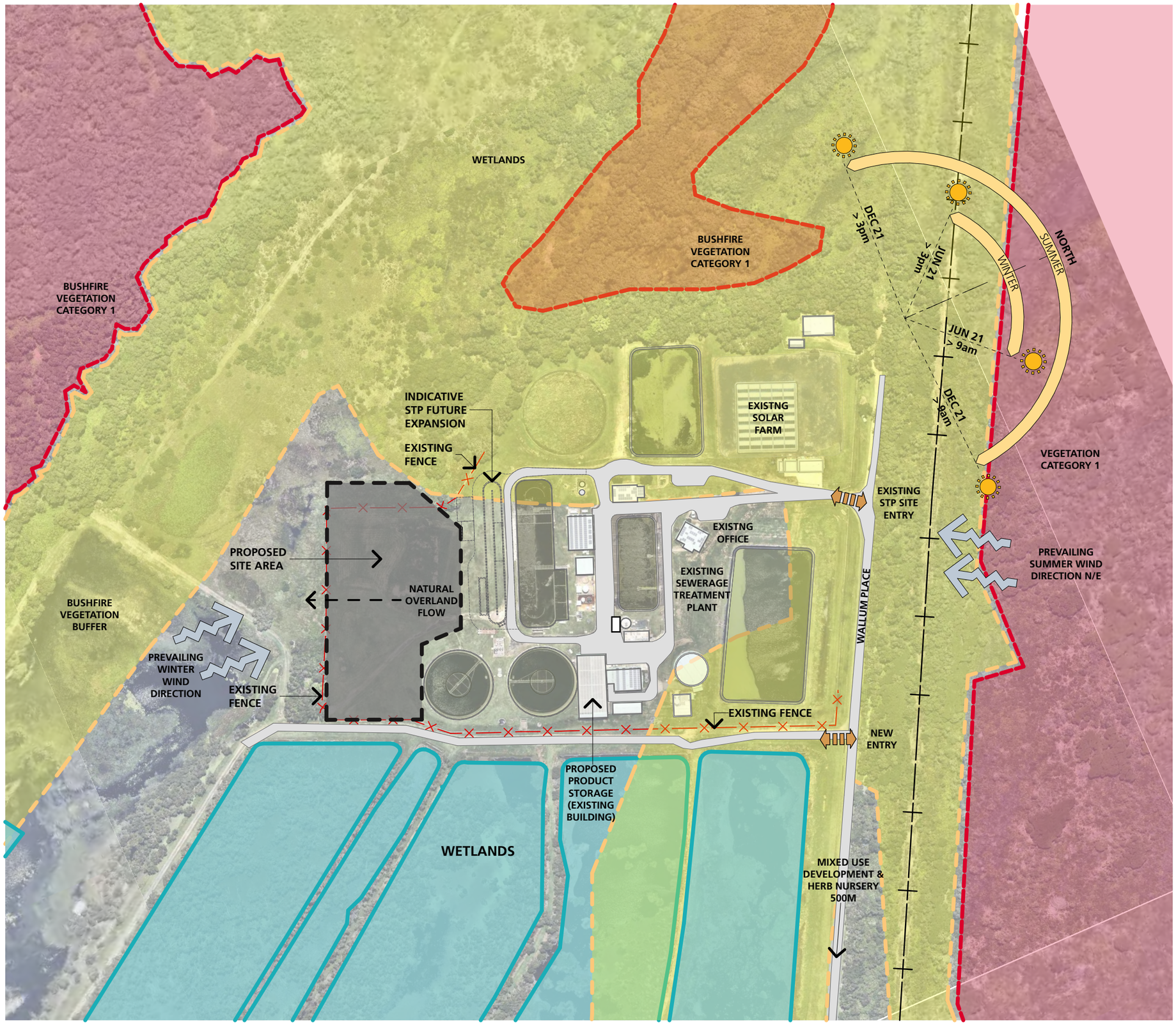

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LEGEND

- VEHICLE ENTRY
- PROPOSED SITE AREA
- TRAINLINE
- EXISTING FENCELINE
- BUSHFIRE VEGETATION BUFFER
- BUSHFIRE CATEGORY 1
- BUSHFIRE CATEGORY 2
- WETLANDS

SITE ADDRESS 45 Wallum Place, Byron Bay, Lot 2, DP706286

SITE AREA Site boundary TBC. Overall lot area 104 hectares

ZONE RU2 Rural Landscape

SLOPE Average gradient of 5% within proposed site area

WIND

Prevailing winds come from the South and West in winter and during summer the prevailing winds are from both North East and South.

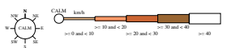
BUSHFIRE

The site is adjacent to the bushfire vegetation buffer zoned land

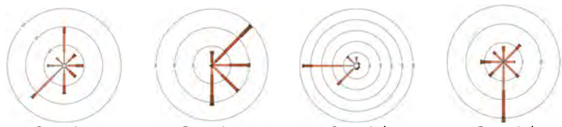
FLOODING

Maximum 100 year flood level:	3.80m AHD
2100 Flood planning level:	4.30m AHD

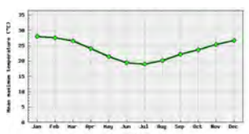
CLIMATE ANALYSIS



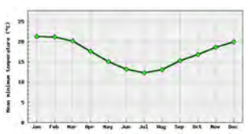
WIND SPEED & DIRECTION ROSES



CLIMATE STATISTICS - UNIVERSITY OF NEWCASTLE



Mean Max. Temperature
Range: 18 - 28 degrees celsius



Mean Min. Temperature
Range: 11 - 23 degrees celsius

4312
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Site Analysis

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 20 40 60 80 100 1:2000 @A3

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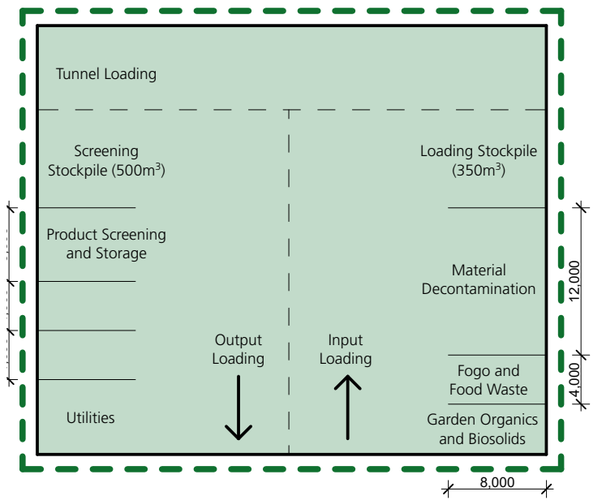
FUNCTIONAL AREA REQUIREMENTS

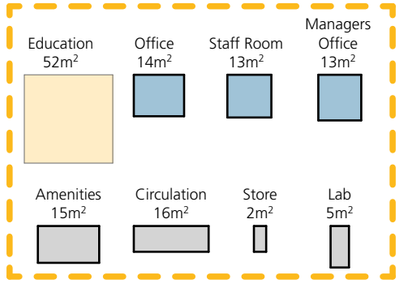
Functional area requirements for technical uses are based on information supplied by Skala.

RECEIVAL HALL - 1450m²



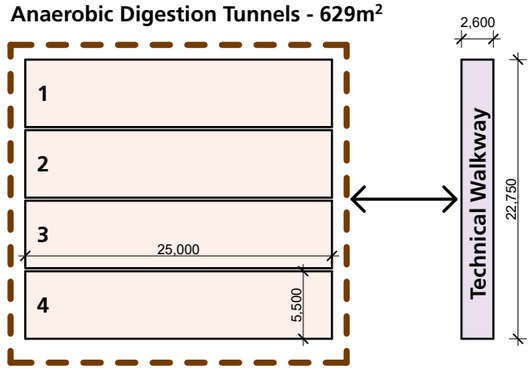
- 9.5m clear height (for tipper truck)
- 2 X high speed roller shutters for truck access
- Sealed and bunded concrete floor
- Galvanised steel portal frame construction
- Low level concrete push walls (2m high)
- Metal roof and wall cladding
- Translucent roof sheeting for natural light
- Negative pressure exhaust system
- Reverse in access to loading areas for 19m semi-trailer

Office Building - 130m²



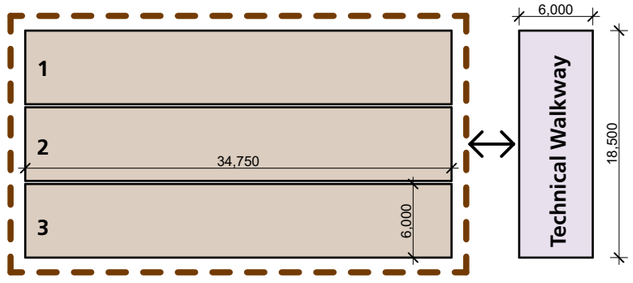
- Office building for up to 4 staff
- 1 private office for manager
- Staff kitchen and lunch room
- Amenities including shower, WC
- Education room for use by a community group or small class of school children (20)
- Small lab, requirements TBC

Anaerobic Digestion Tunnels - 629m²



- Cast-insitu concrete walls
- Post tensioned concrete roof
- Sealed air and water tight structure
- Floor and wall heating pipes
- Hinged, sealed access doors
- Roof mounted biogas storage

Aerobic Composting Tunnels - 754m²



- Cast-insitu concrete walls
- Post tensioned concrete roof
- Sealed air and water tight structure
- Floor and wall heating pipes
- Sliding, sealed access doors
- Underfloor air and drainage system
- Ducted air supply and exhaust system
- Humidification system
- Roof mounted technical container for plant

Biofilter - 440m²

- Filters exhaust air from the receival hall and tunnels
- Concrete base with 2m high concrete walls
- Length to width ratio 1:1, 1:2.5
- Plastic grates with biofilter media over

Percolate Storage Tank & Sand Filter - 131m²

- Reinforced concrete storage tank for percolate liquid
- Manhole access for maintenance
- Sand filter seperate compartment

Combined Heat and Power Unit - 38m²

- Utilises biogas energy to provide heating and power to the facility
- Proprietary system by BEKON

Car Parking - 206 m²

- Parking for 4 staff + 2 visitors
- 1 accessible parking space

Flare - 6m² (nom)

- For burning off excess biogas
- 10m high

4312
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Functional Area and Design Requirements

Byron Bay Bioenergy Facility

45 Wallum Place, Byron Bay, NSW

0m 5 10 15 20 25 1:500 @A3

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1


2


3


4


5


6

1 - 2. Looking S-SW [from existing sewer treatment plant toward the distant vegetation]
3. Group of trees near the existing entry gates which access the proposed site.
4 - 6. Looking N [from southern boundary fence towards existing sewer treatment plant]

4312
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Site Photos - Sheet 01

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

NTS
@A3

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7


8


9


10


11


12


13


14

7 - 10. Existing infrastructure and boundary fence along the site access road
11 - 12. Looking NW from near the existing entry gates that access the proposed site
13. Vegetation near north western fenceline of proposed site
14. Looking south east toward existing sewer treatment tank

4312
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RevB 30/4/21

Site Photos - Sheet 02

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

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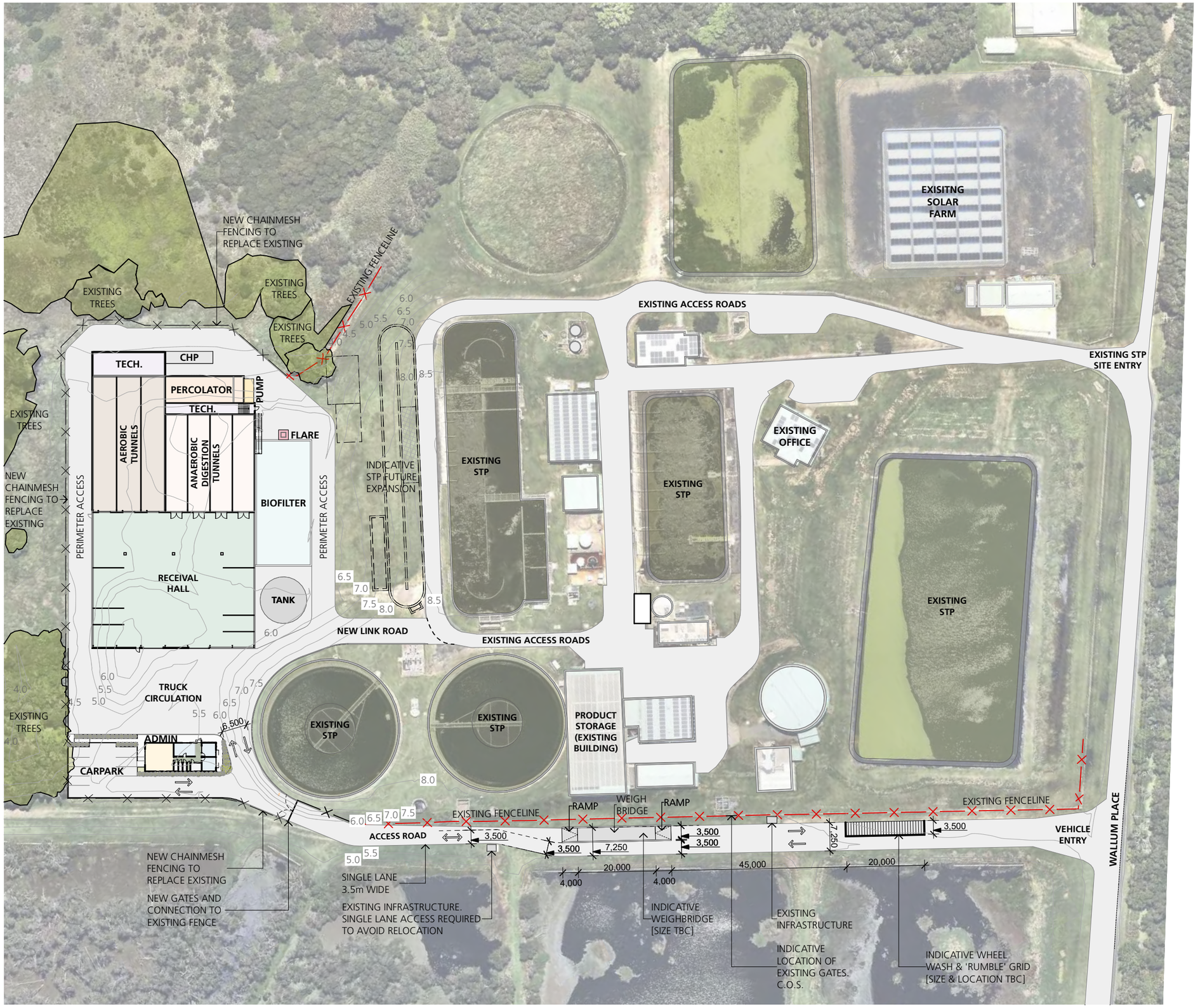

SKALA

Byron Shire Council

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4312
SK1100
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Proposed Site Plan w. Aerial View overlay

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 10 20 30 40 50 1:1000 @A3

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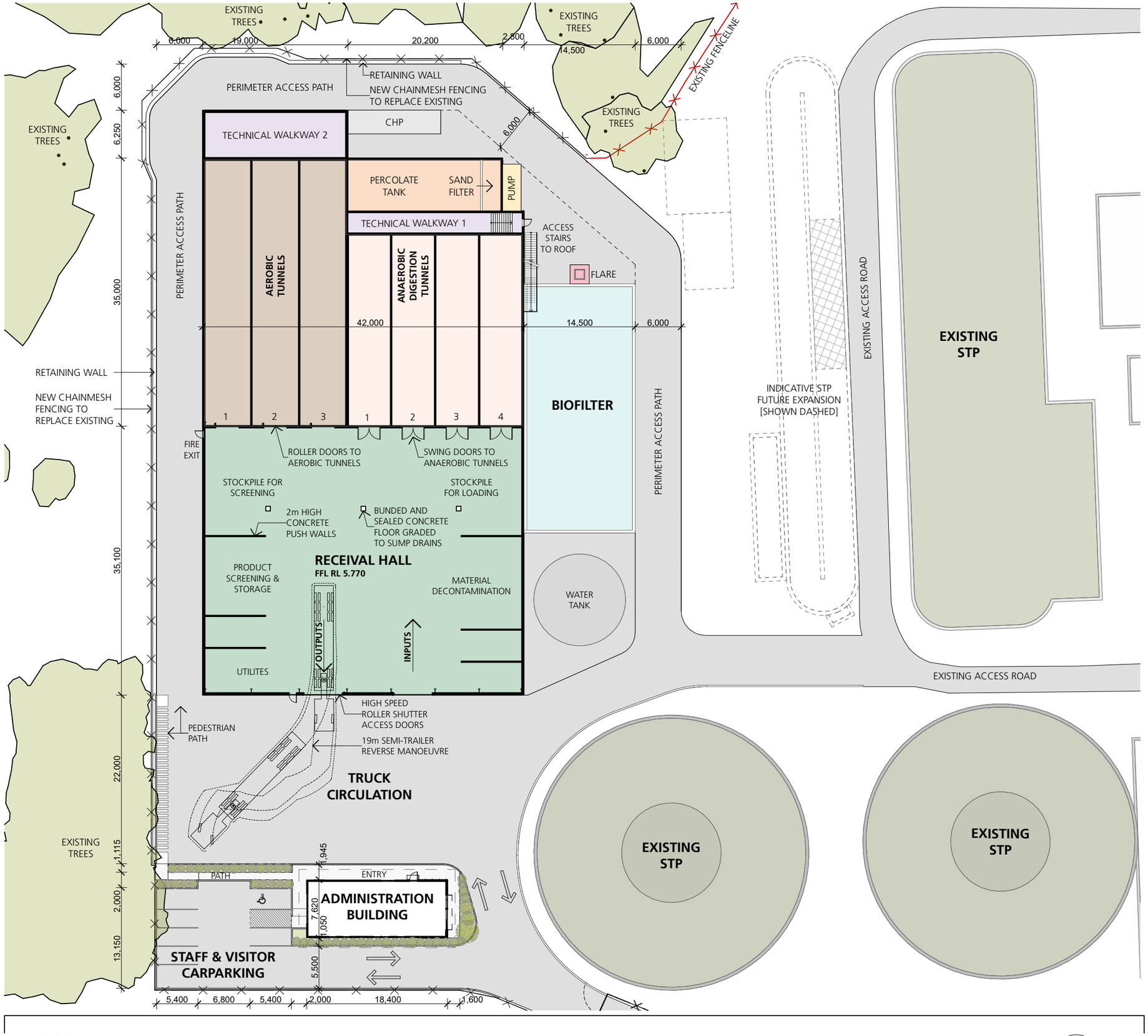

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AREA SCHEDULE

ZONE	AREA (m²)	
Buildings		
Receival Hall	1450	
Tunnels (incl. tech. walkways)	1383	(1212 + 171)
Percolate Tank	131	
Administration	130	
CHP	38	
Biofilter	440	
	Total: 3572	
Hardstand		
Truck circulation + access road in	2956	
Carpark [incl. access & circulation]	236	
	Total: 3192	
Other		
Perimeter access	1381	
	Total: 1381	

4312
SK1101
RevU 16/6/21

Proposed Site Plan

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 5 10 15 20 25 1:500 @A3

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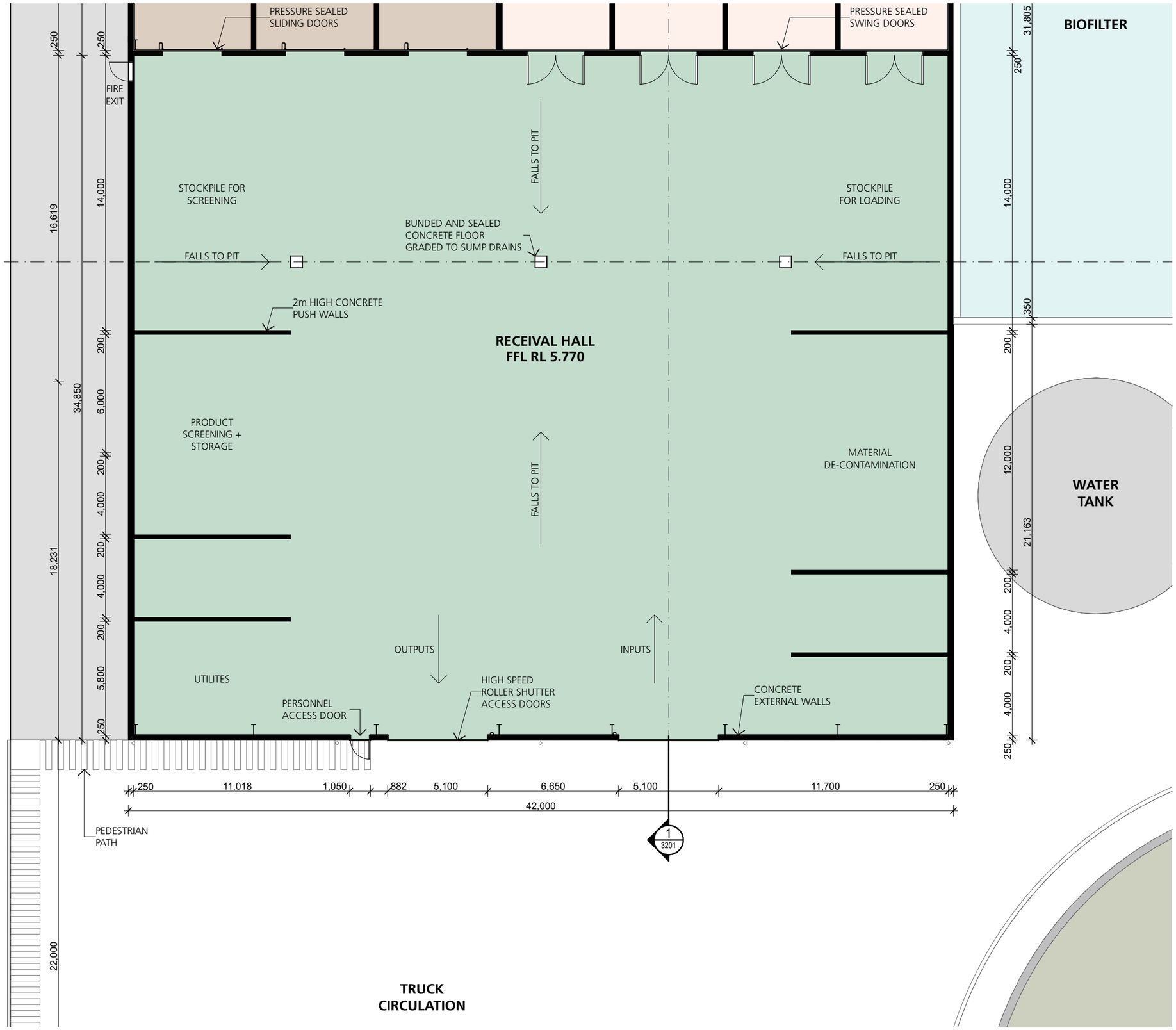

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4312
SK2201
RevA 30/4/21

Floor Plan - Receival Hall

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 2 4 6 8 10 1:200 @A3

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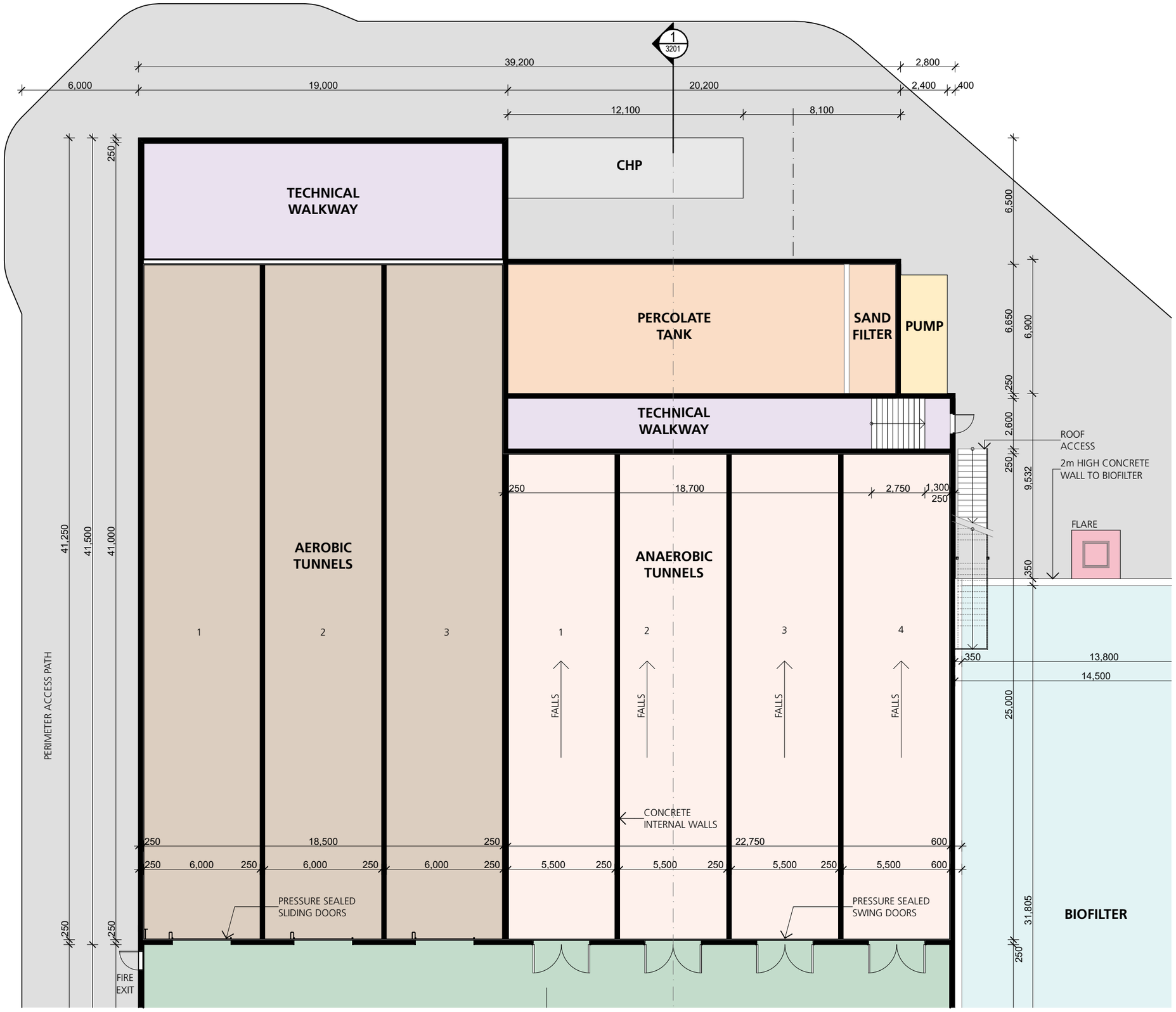

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4312
SK2202
RevA 30/4/21

Floor Plan - Composting Tunnels

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 2 4 6 8 10 1:200 @A3

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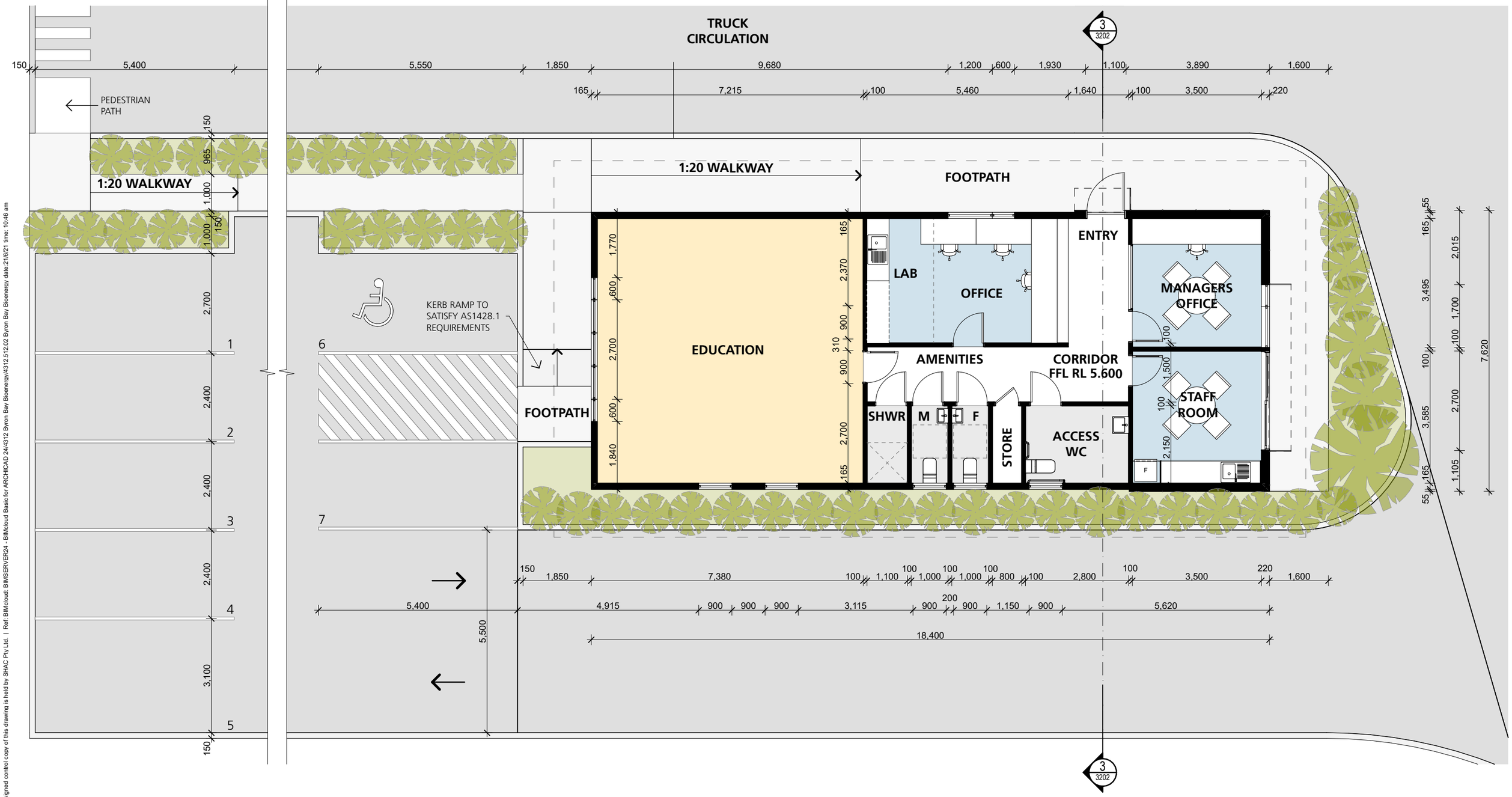

4312
SK2210
RevA 30/4/21

Floor Plan - Administration Building

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 1 2 3 4 5 1:100 @A3

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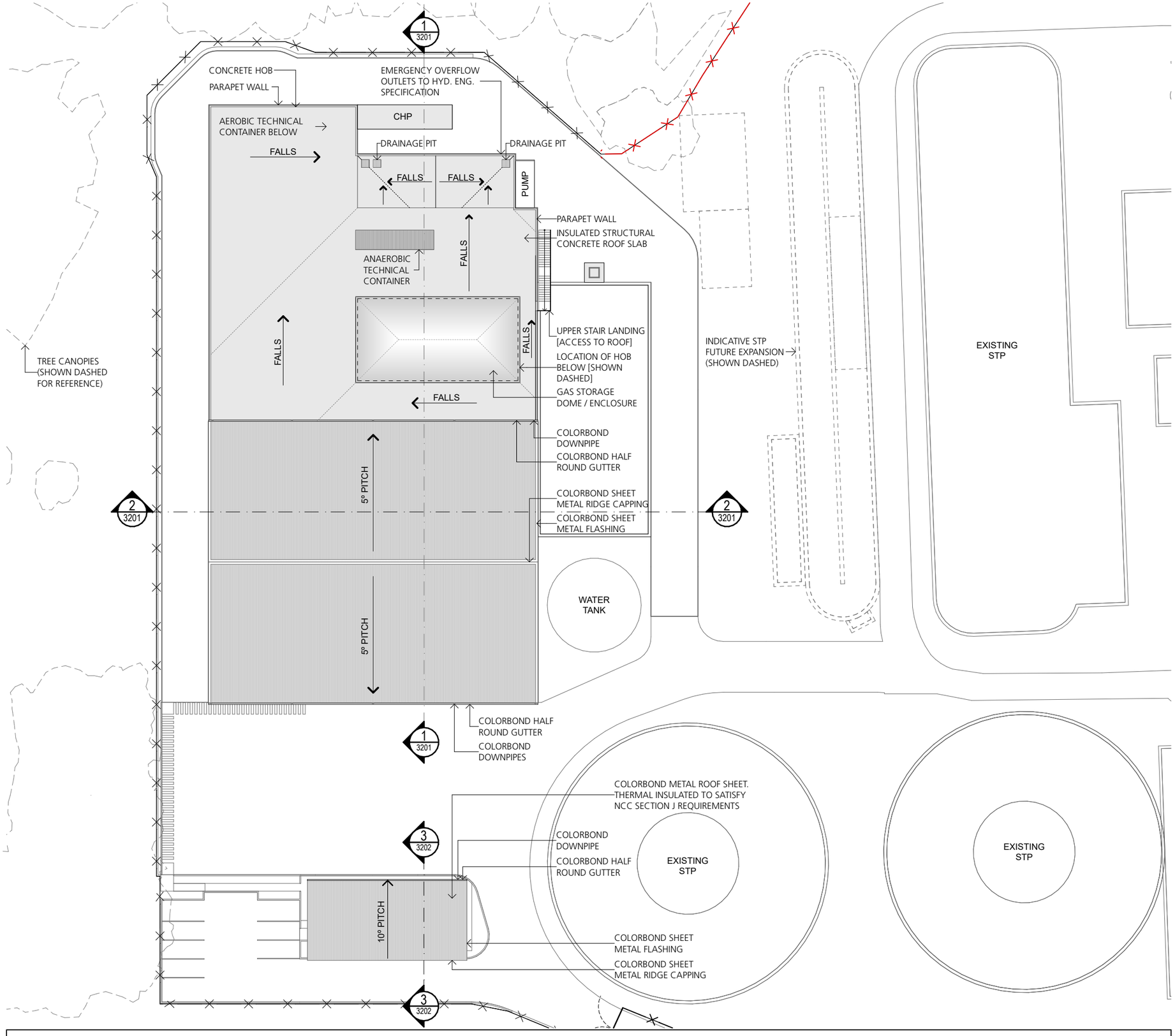

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4312
SK2401
RevC 16/6/21

Roof Plan

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 5 10 15 20 25 1:500 @A3

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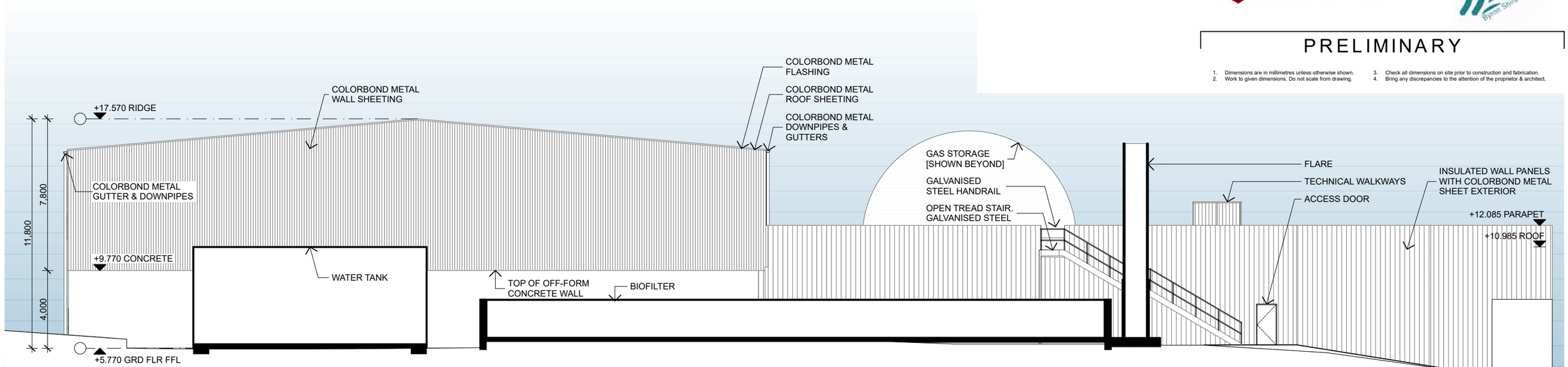
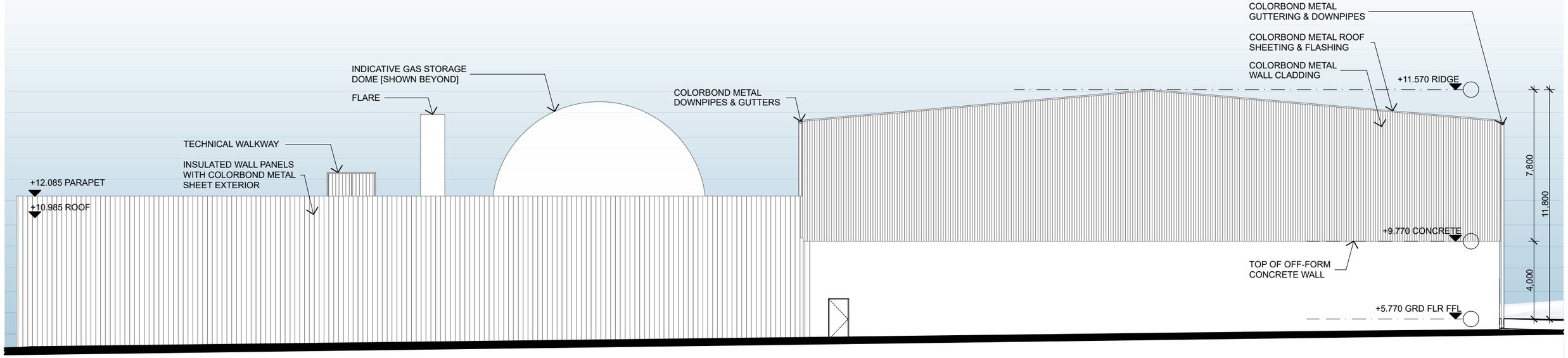


NORTH ELEVATION
SCALE: 1:200



SOUTH ELEVATION
SCALE: 1:200

4312
SK3101
RevA 30/4/21

North & South Elevations - Main Building

Byron Bay Bioenergy Facility

45 Wallum Place, Byron Bay, NSW

0m 2 4 6 8 10 1:200 @A3

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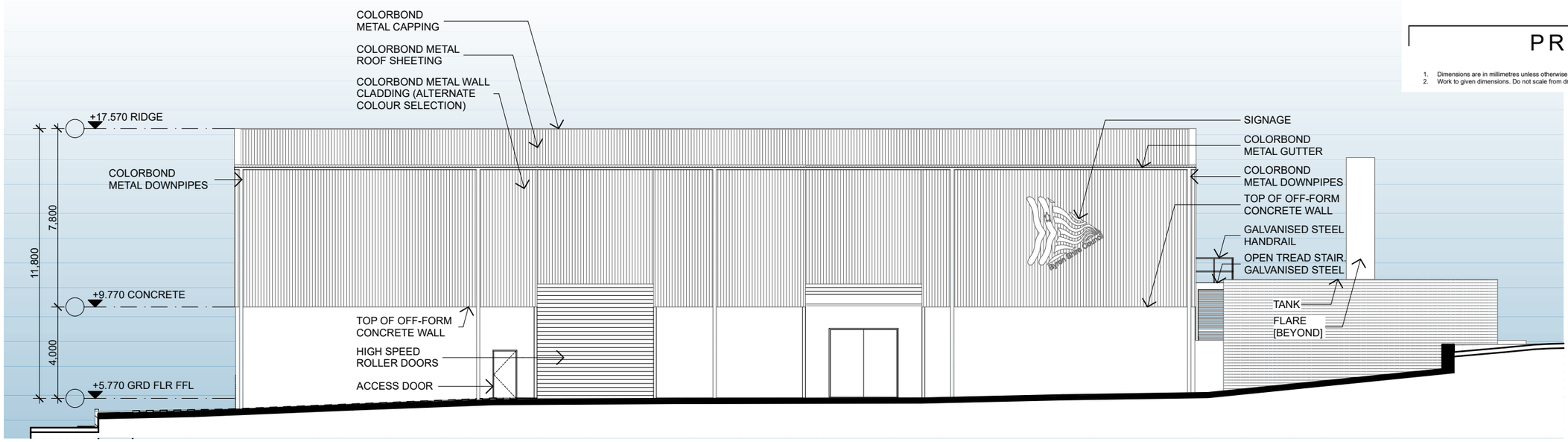
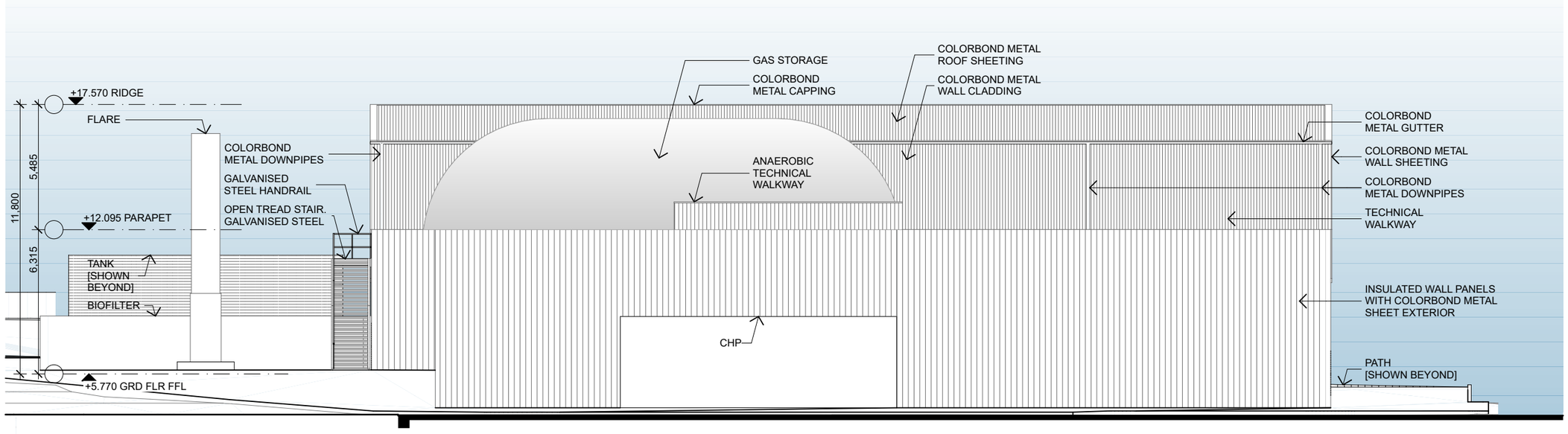


EAST ELEVATION
SCALE: 1:200



WEST ELEVATION
SCALE: 1:200

4312
SK3102
RevA 30/4/21

East & West Elevations - Main Building

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 2 4 6 8 10 1:200 @A3

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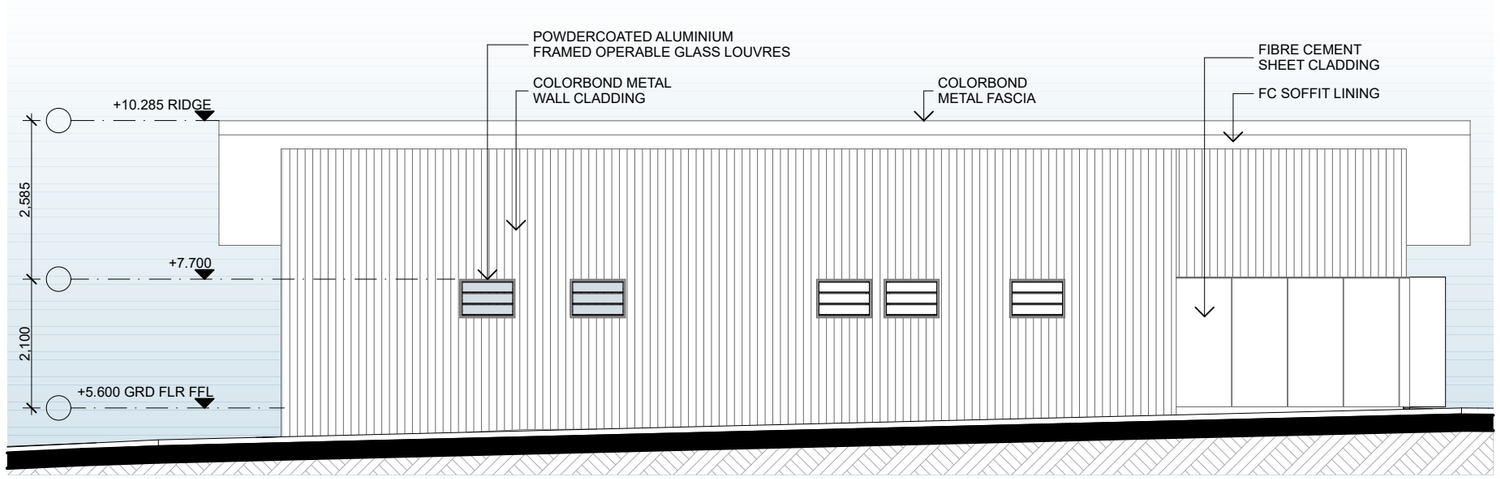
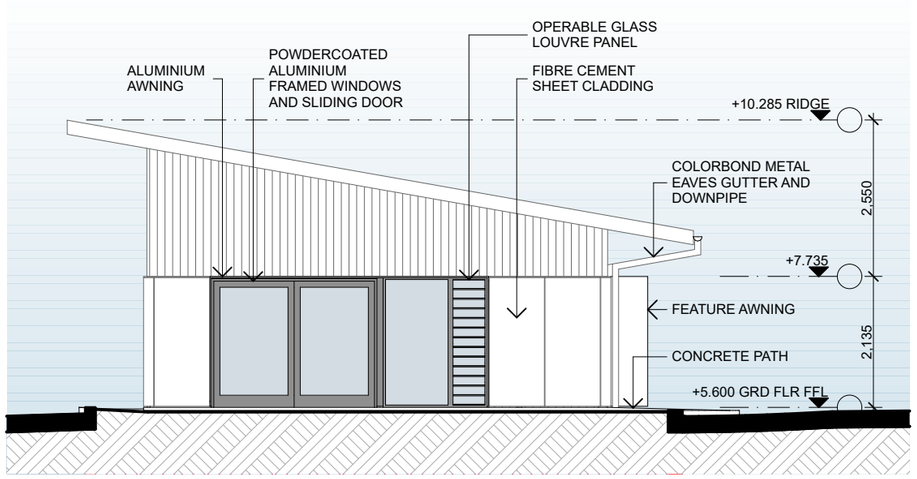


EAST ELEVATION
SCALE: 1:100



NORTH ELEVATION
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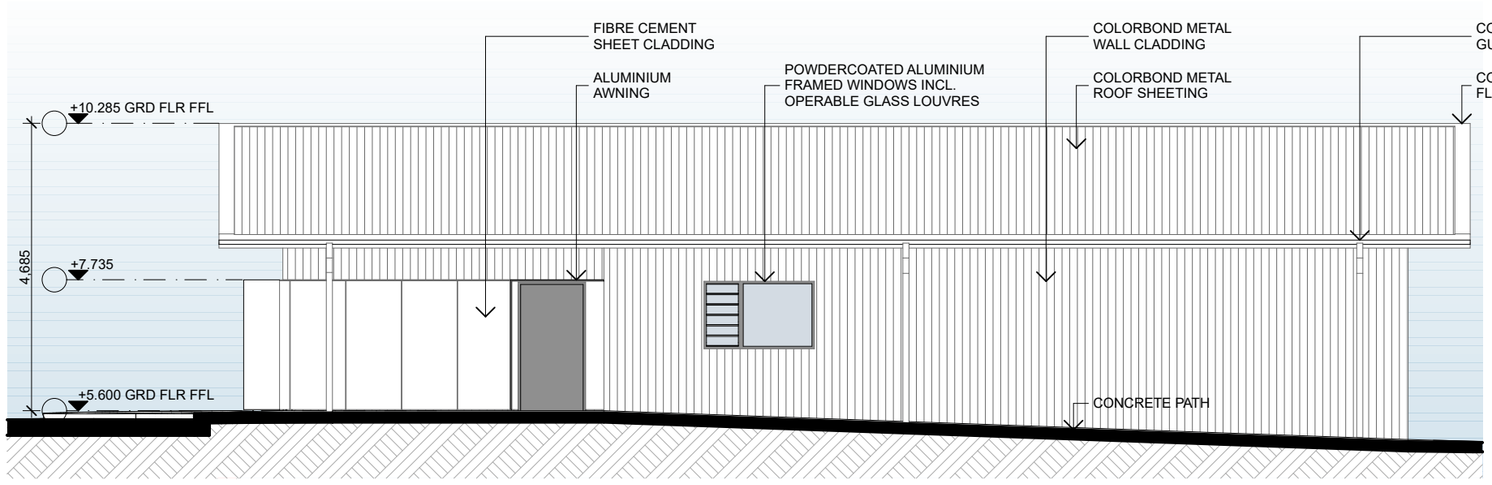

WEST ELEVATION
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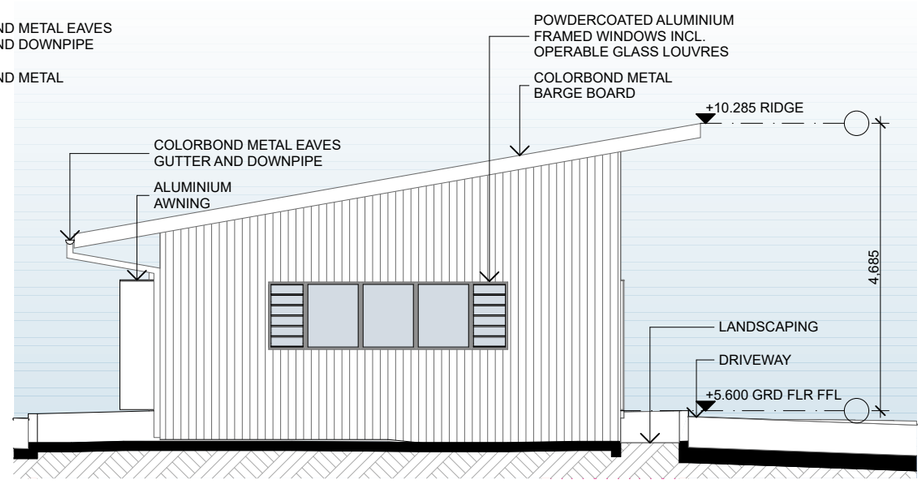

SOUTH ELEVATION
SCALE: 1:100

4312
SK3110
RevA 30/4/21

Elevations - Administration Building

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 1 2 3 4 5 1:100 @A3

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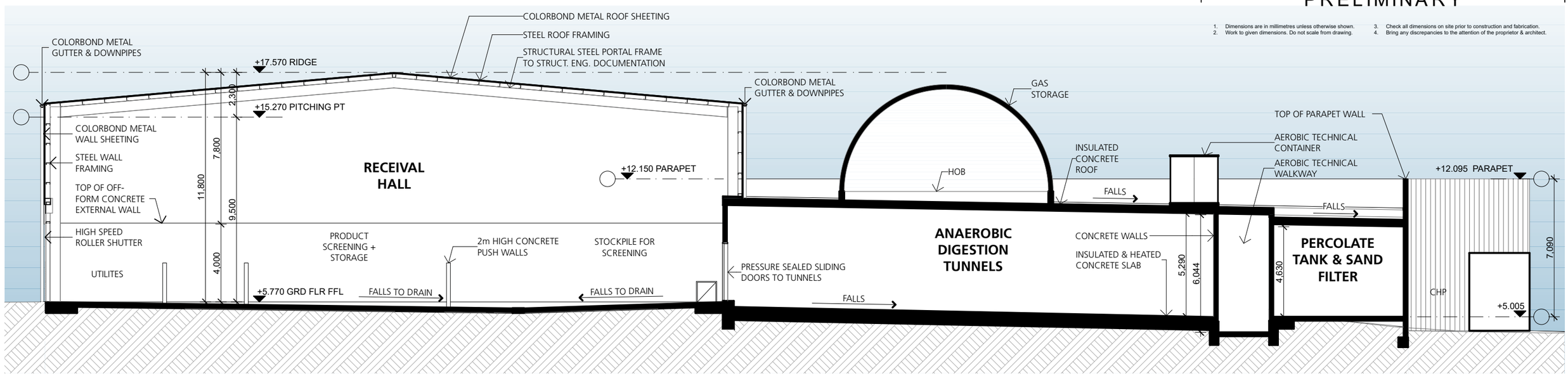

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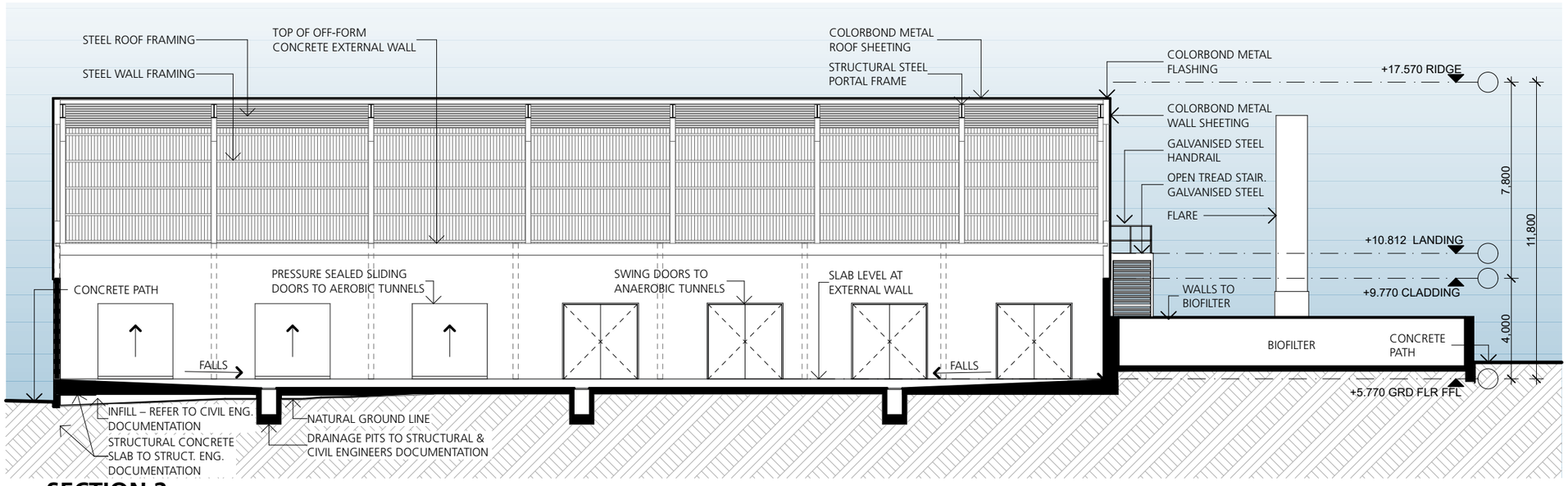

SECTION 2
SCALE: 1:200

4312
SK3201
RevA 30/4/21

Sections 1 & 2

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 2 4 6 8 10 1:200 @A3

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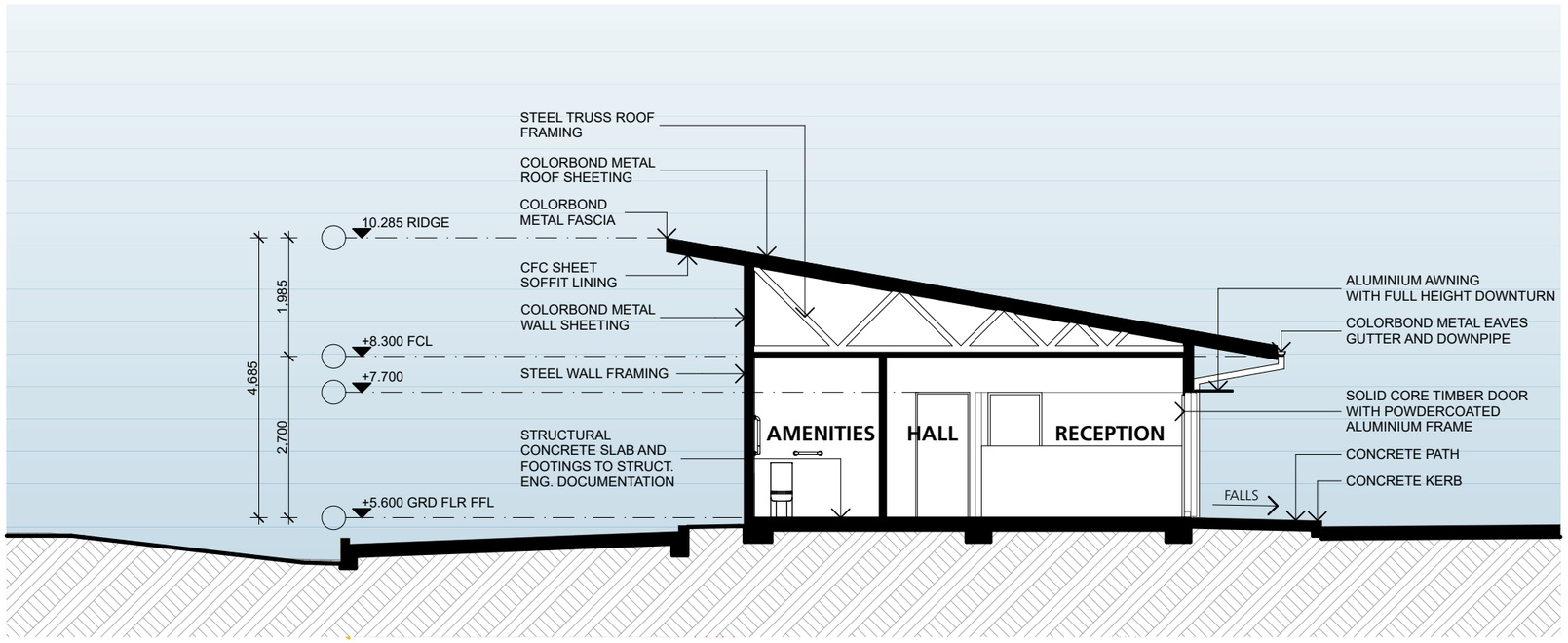

4312
SK3202
RevB 30/4/21

Sections - Administration Building

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 1 2 3 4 5 1:100 @A3

SHAC

Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

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1. Dimensions are in millimetres unless otherwise shown.
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3. Check all dimensions on site prior to construction and fabrication.
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4312
SK9001
RevB 30/4/21

Perspective View – Sheet 01

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

NTS
@A3

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Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

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1. Dimensions are in millimetres unless otherwise shown.
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3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

4312
SK9002
RevB 30/4/21

Perspective View – Sheet 02

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

NTS
@A3

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Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

Appendix B – Revised Site Layout Plans (Updated)

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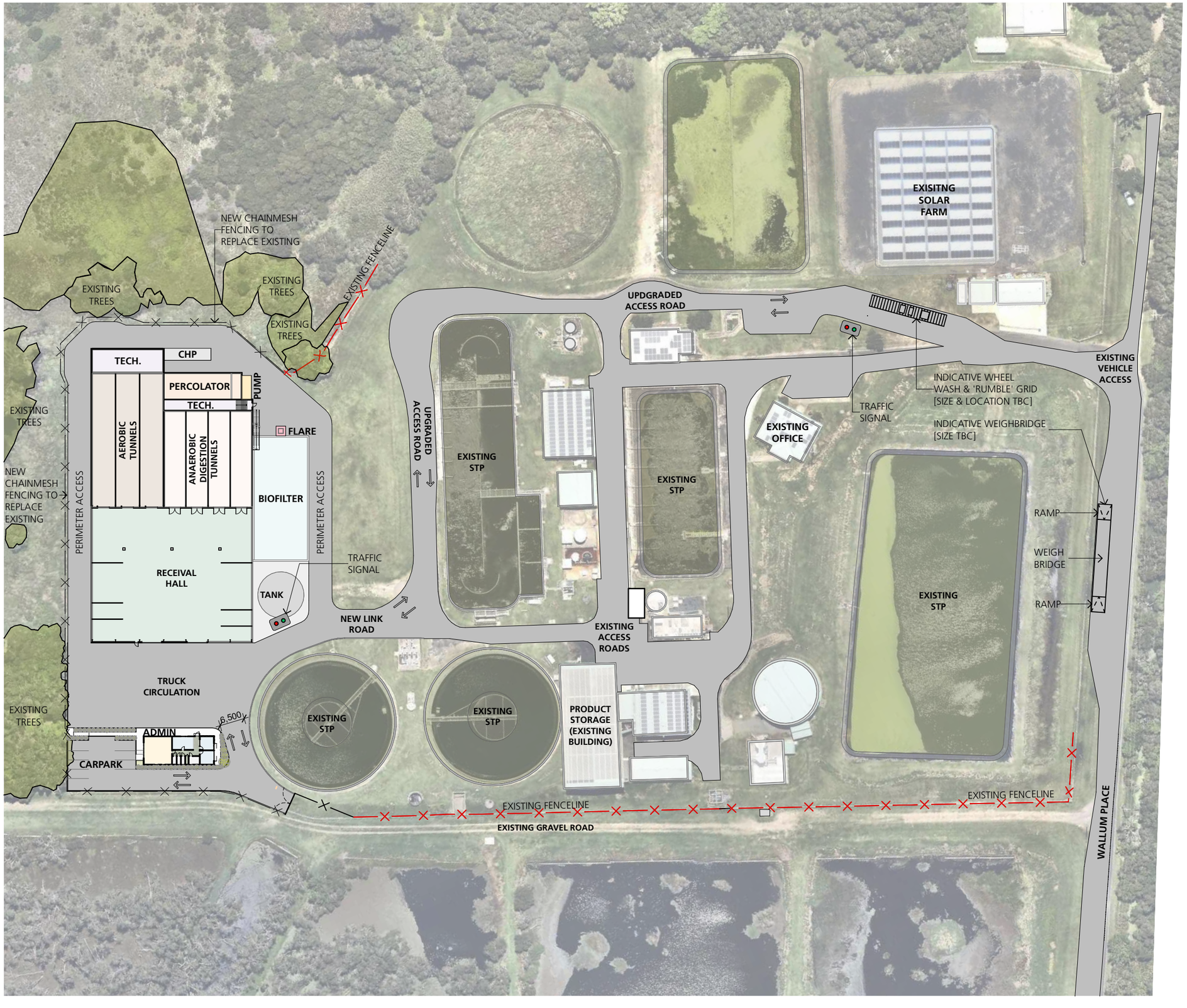

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3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

4312
SK1100
RevS 22/12/21

Proposed Site Plan w. Aerial View overlay

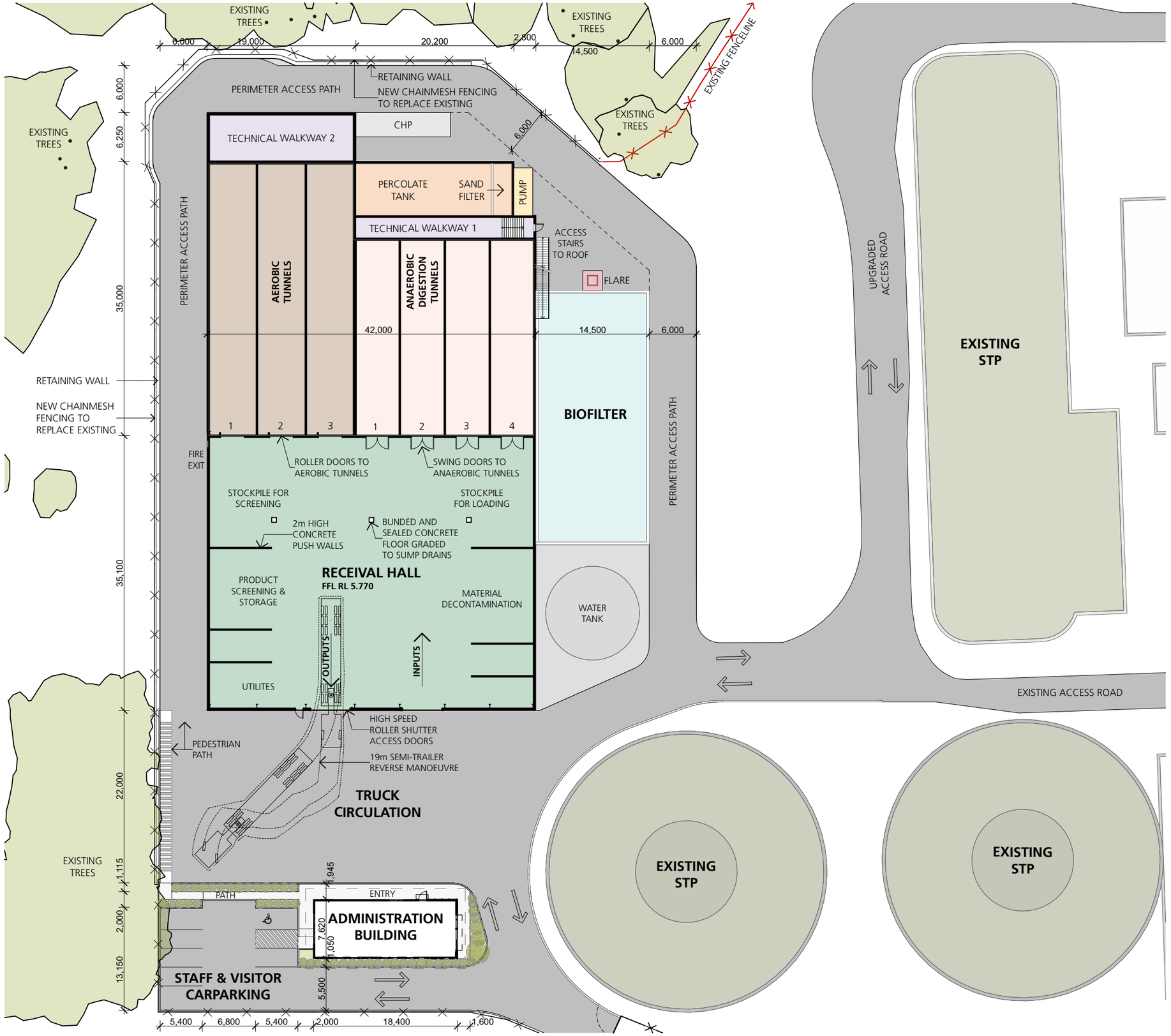
Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 10 20 30 40 50 1:1000 @A3

SHAC

Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

Drawing and design © SHAC Pty Ltd. The signed control copy of this drawing is held by SHAC Pty Ltd. | Ref: /Volumes/Projects/4300/4312 Byron Bay Bioenergy Facility/512 Sketch Design/4312.512.21 - DA submission with new Access Road.pln date:22/12/21 time: 3:05 pm



SKALA

Byron Shire Council

PRELIMINARY

1. Dimensions are in millimetres unless otherwise shown.
2. Work to given dimensions. Do not scale from drawing.
3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

AREA SCHEDULE

ZONE	AREA (m²)	
Buildings		
Receival Hall	1450	
Tunnels (incl. tech. walkways)	1383	(1212 + 171)
Percolate Tank	131	
Administration	130	
CHP	38	
Biofilter	440	
	Total: 3572	
Hardstand		
Truck circulation + access road in	2956	
Carpark [incl. access & circulation]	236	
	Total: 3192	
Other		
Perimeter access	1381	
	Total: 1381	

4312
SK1101
RevV 22/12/21

Proposed Site Plan

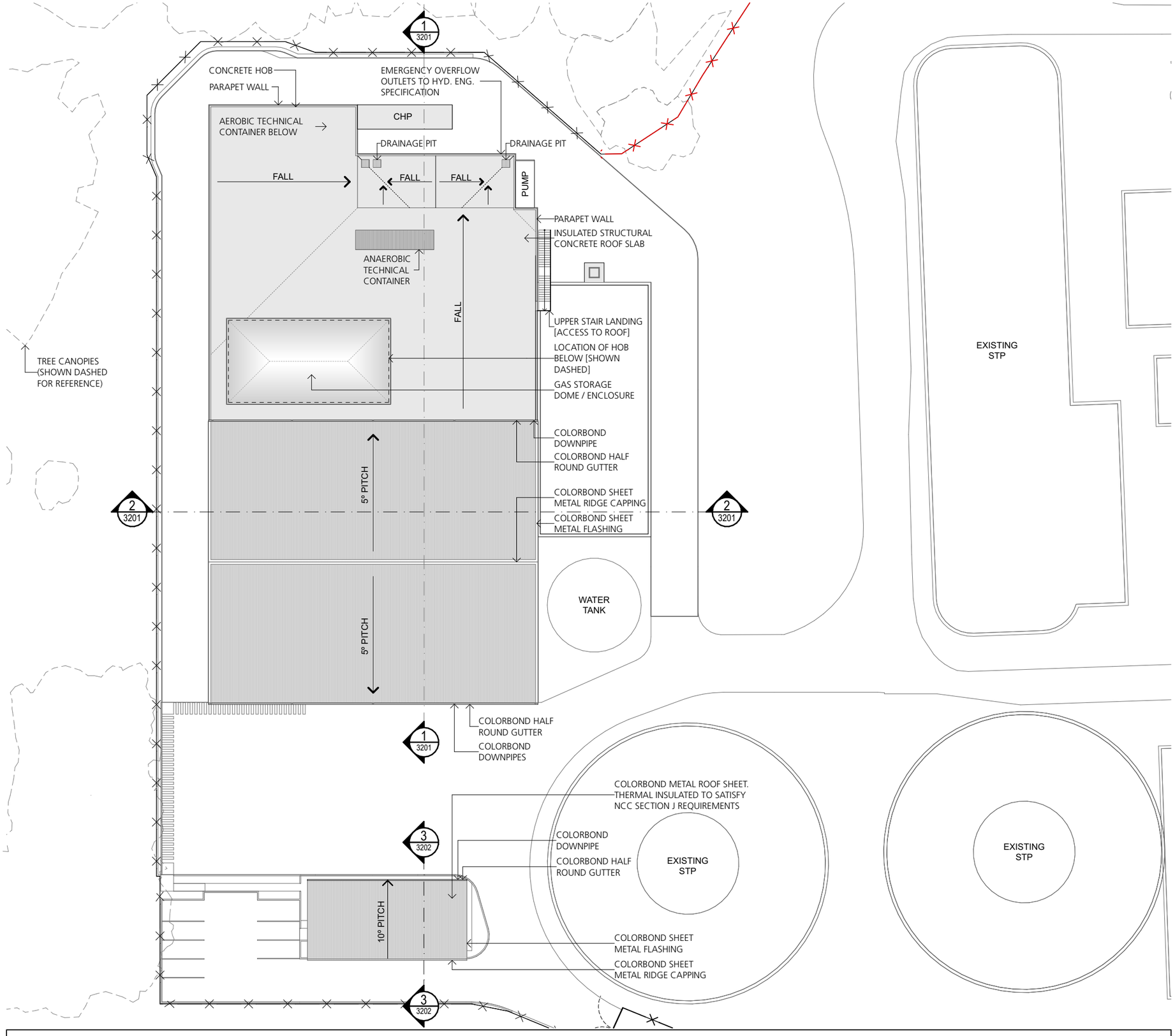
Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 5 10 15 20 25 1:500 @A3

SHAC

Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

Drawing and design © SHAC Pty Ltd. The signed control copy of this drawing is held by SHAC Pty Ltd. | Ref: /Volumes/Projects/4300/4312 Byron Bay Bioenergy Facility/512 Sketch Design/4312.512.21 - DA submission with new Access Road.pln date:22/12/21 time: 3:05 pm



PRELIMINARY

1. Dimensions are in millimetres unless otherwise shown.
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3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

4312
SK2401
RevF 22/12/21

Roof Plan

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 5 10 15 20 25 1:500 @A3

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SHAC
Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

Appendix C – Site Layout Plans Evolution (since 2019)

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Index	Änderungen	gezeichnet	Datum

Draft

Bauherr :

SKALA Australia Pty Ltd
13/21 BabillaClose Beresfield NSW 2322

Planung :

BEKON GmbH
Feringastraße 9
85774 Unterföhring

BEKON

Projekt:

Byron Shire Council
Bioenergy Project

Objekt-Nr. : 818901

Maßstab : 1:100

Gezeichnet : A. Barnsteiner

Geplant : H. P. Erhard

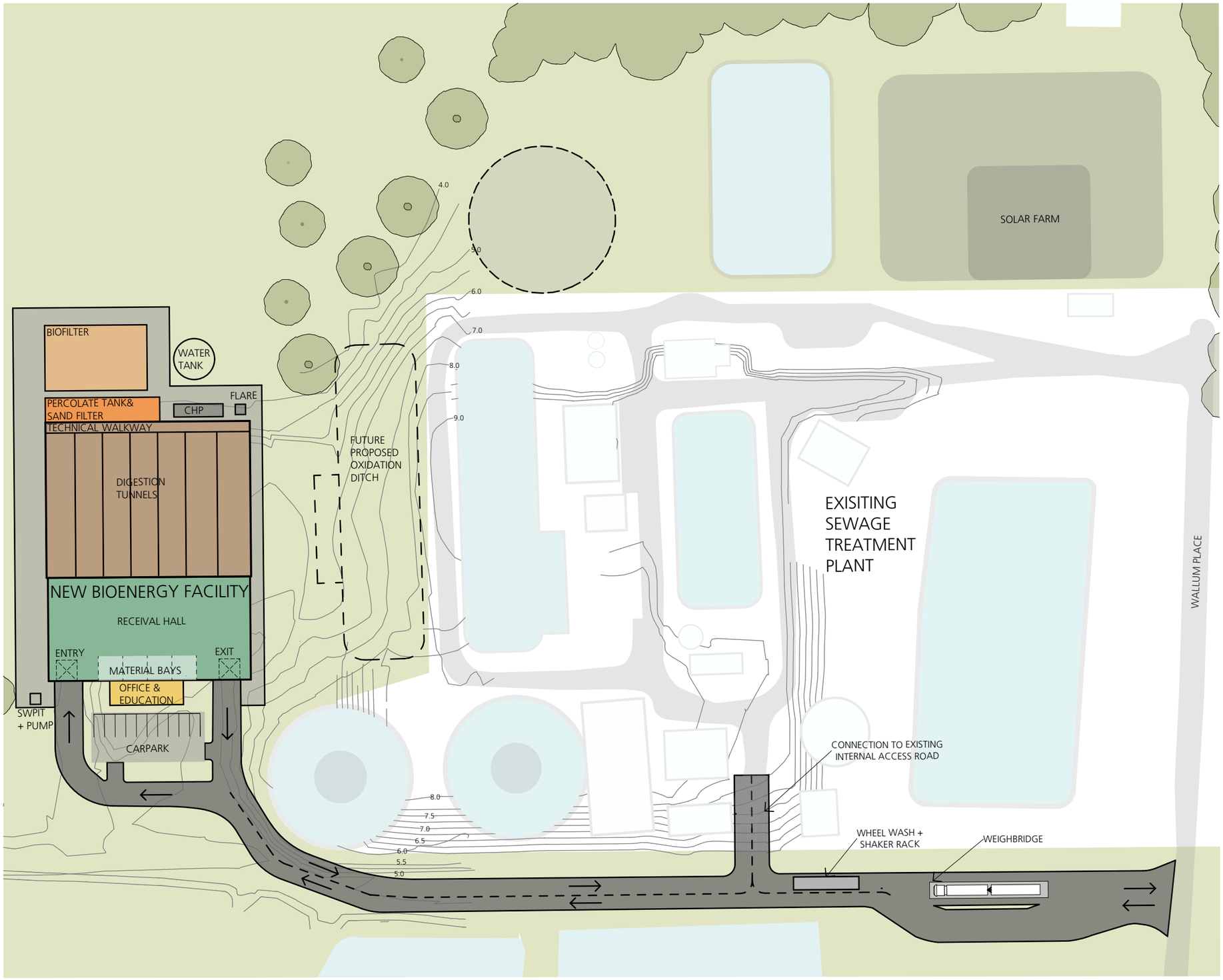
Datum Planstand : 21.10.2019

Planinhalt:

Ground Floor Layout 1:100

Zeichnung-Nr: 818901_AP_021

Index -



Byron Shire Council

PRELIMINARY

1. Dimensions are in millimetres unless otherwise shown.
2. Work to given dimensions. Do not scale from drawing.
3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

LEGEND

- RECEIVAL HALL
- DIGESTION TUNNELS
- BIOFILTER
- EXISTING TREES
- EXISTING ACCESS ROAD
- PROP0SED ACCESS ROAD
- OFFICE & EDUCATION
- HARDSTAND
- MAIN VEHICLE CIRCULATION
- EXISTING CONTOURS 0.5m INTERVAL

AREA SCHEDULE

ZONE NAME	AREA
ACCESS ROAD	3,325.71
DIGESTION TUNNELS & RECEIVAL HALL	3,150.71
HARDSTAND	1,809.42
OFFICE & EDUCATION	108.03
TOTAL DEVELOPMENT AREA	8,393.87 m²

mpc CONSULTING & MANAGEMENT

SKALA

JACKSON ENVIRONMENT AND PLANNING
STRATEGY | INFRASTRUCTURE | COMPLIANCE | PROCUREMENT

4312
WD1001
RevC 23/03/2020

Proposed Site Plan

Byron Bay Bioenergy Facility
Wallum Place, Byron Bay

0m 10 20 30 40 50 1:1000 @A3

SHAC

Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

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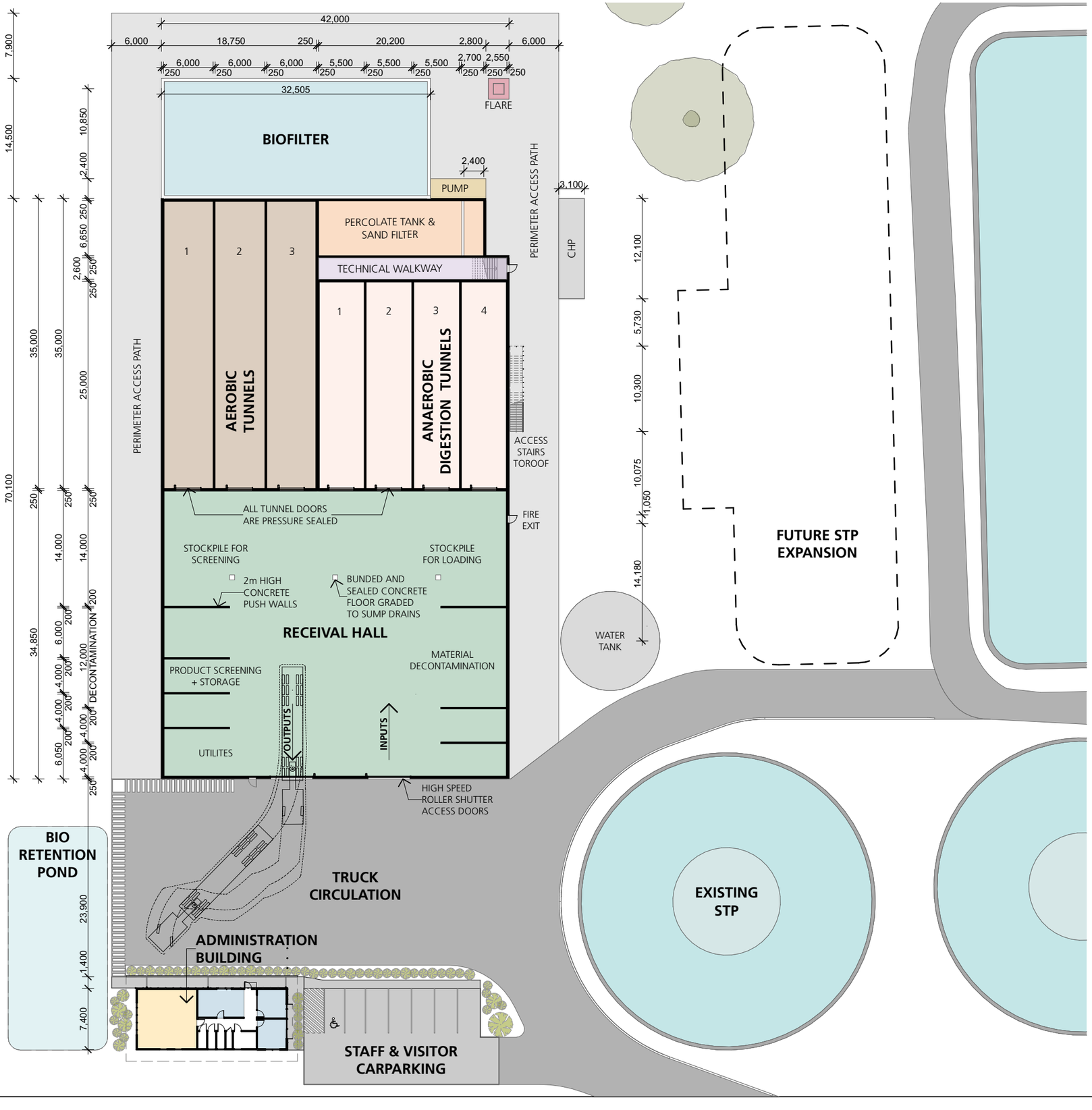

SKALA

Byron Shire Council

PRELIMINARY

1. Dimensions are in millimetres unless otherwise shown.
2. Work to given dimensions. Do not scale from drawing.
3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

AREA SCHEDULE

ZONE	AREA (m²)	
Buildings		
Receival Hall	1460	
Tunnels (incl. walkway)	1320	(1260 + 60)
Percolate Tank	147	
Administration	137	
CHP	38	
Biofilter	470	
	Total: 3572	
Hardstand		
Truck circulation + access road in	3530	
Carpark	290	
	Total: 3820	
Other		
Bio retention pond	336	
Perimeter access	1600	
	Total: 1936	

4312
SK1101
RevM 12/2/21

Proposed Site Plan

Byron Bay Bioenergy Facility
Wallum Place, Byron Bay

0m 5 10 15 20 25 1:500 @A3

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Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

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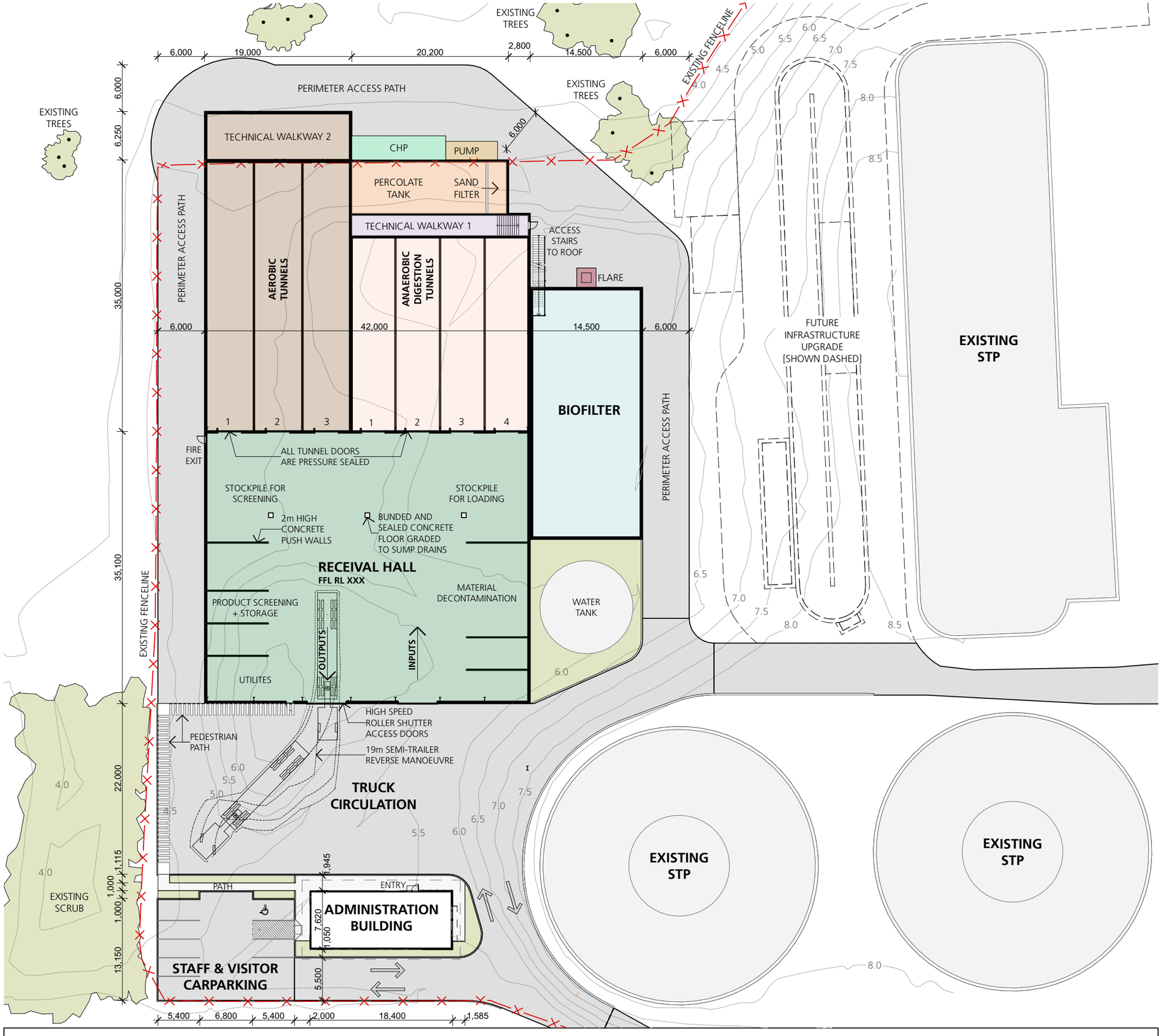

SKALA

Byron Shire Council

PRELIMINARY

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2. Work to given dimensions. Do not scale from drawing.
3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

AREA SCHEDULE

ZONE	AREA (m²)	
Buildings		
Receival Hall	1450	
Tunnels (incl. tech. walkways)	1383	(1212 + 171)
Percolate Tank	131	
Administration	130	
CHP	38	
Biofilter	440	
	Total: 3572	
Hardstand		
Truck circulation + access road in	2956	
Carpark	236	
	Total: 3192	
Other		
Perimeter access	1381	
	Total: 1381	

4312
SK1101
RevN 25/3/21

Proposed Site Plan

Byron Bay Bioenergy Facility

45 Wallum Place, Byron Bay, NSW

0m 5 10 15 20 25 1:500 @A3

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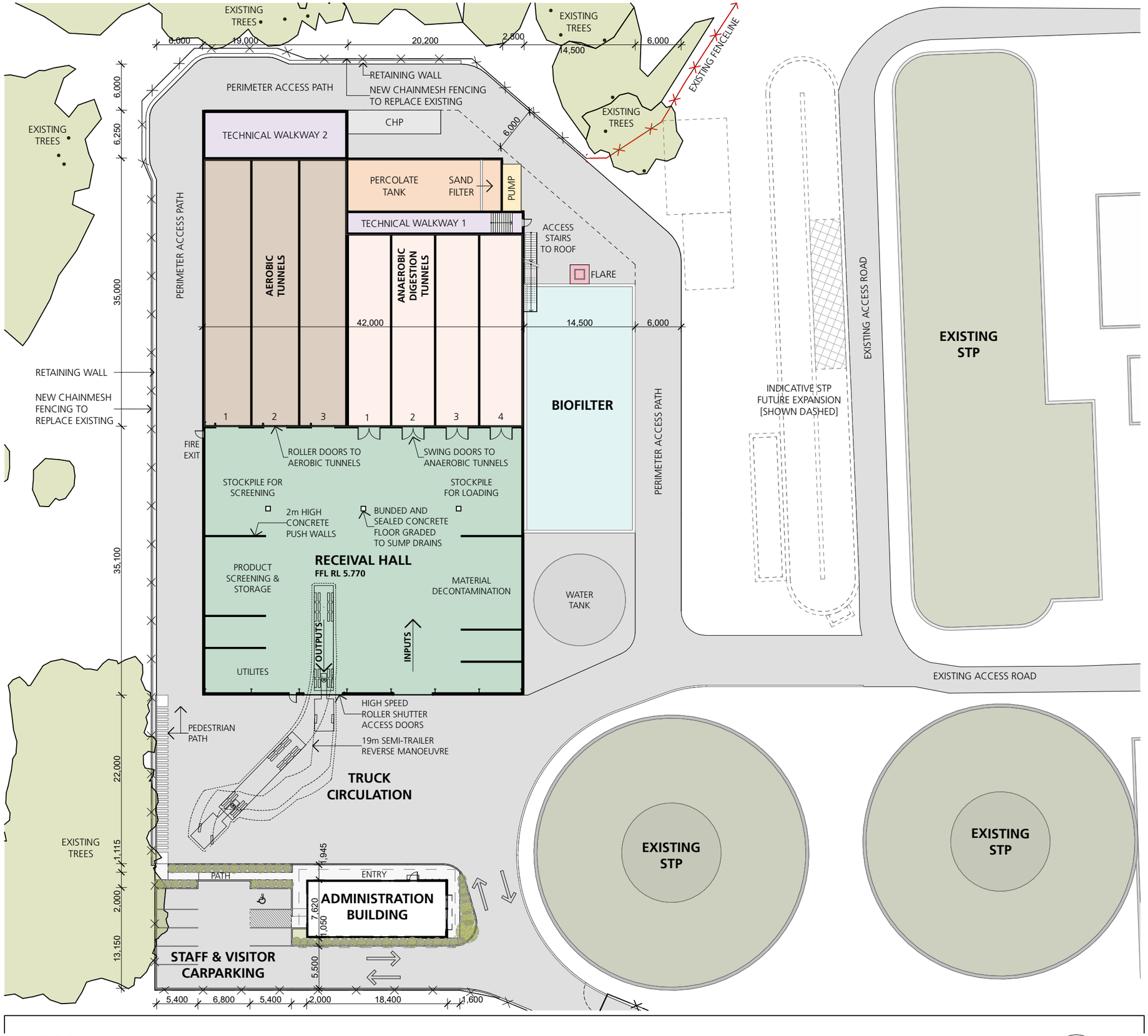

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AREA SCHEDULE

ZONE	AREA (m²)	
Buildings		
Receival Hall	1450	
Tunnels (incl. tech. walkways)	1383	(1212 + 171)
Percolate Tank	131	
Administration	130	
CHP	38	
Biofilter	440	
	Total: 3572	
Hardstand		
Truck circulation + access road in	2956	
Carpark [incl. access & circulation]	236	
	Total: 3192	
Other		
Perimeter access	1381	
	Total: 1381	

4312
SK1101
RevU 16/6/21

Proposed Site Plan

Byron Bay Bioenergy Facility
45 Wallum Place, Byron Bay, NSW

0m 5 10 15 20 25 1:500 @A3

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100mm AT ORIGINAL SIZE

N

NEW CHAINMESH FENCING TO REPLACE EXISTING

EXISTING FENCELINE

EXISTING TREES

EXISTING TREES

EXISTING TREES

EXISTING TREES

NEW CHAINMESH FENCING TO REPLACE EXISTING

TECH.

CHP

PERCOLATOR

TECH.

PUMP

AEROBIC TUNNELS

ANAEROBIC DIGESTION TUNNELS

PERIMETER ACCESS

PERIMETER ACCESS

RECEIVAL HALL

TANK

TANK

INDICATIVE STP FUTURE EXPANSION

NEW LINK ROAD

EXISTING ACCESS ROADS

ROAD 01 CONTROL LINE

EXISTING ACCESS ROADS

EXISITNG SOLAR FARM

CH 180
CT181.60

TC165.39

CH 160

CH 200

EXISTING STP

CH 220

CH 240
TC243.73

CH 140

CT132.89

TC129.04

CH 120

CH 100
CT101.61
CT105.82

CT77.63
CH 80

TC84.81

CH 60

CT42.77

CH 40

TC36.97

CH 20

EXISTING OFFICE

EXISTING STP

EXISTING STP

CH 0.00

EXISTING STP SITE ENTRY

CT94.34
CH 95.16

CH 80
TC79.59

CH 60

CH 40

CH 20

CH 0.00

WALLUM PLACE CONTROL LINE

WALLUM PLACE

TRUCK CIRCULATION

ADMIN

CARPARK

EXISTING TREES

CH 288.81

CT279.22
CH 280

TC270.77

CT259.92

EXISTING STP

EXISTING STP

PRODUCT STORAGE (EXISTING BUILDING)

EXISTING FENCELINE

EXISTING FENCELINE

NOT FOR CONSTRUCTION

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B	PRELIMINARY DRAWINGS - ISSUED FOR TENDER	06/10/21	AB	SA	NVO	NVO
C	UPDATED DRAFT DRAWINGS - ISSUED FOR TENDER	13/10/21	AB	SA	NVO	NVO

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SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 20 099 261 711
EMAIL: administration@planitconsulting.com.au

CLIENT: BYRON SHIRE COUNCIL

LOCAL GOVERNMENT AUTHORITY: BYRON SHIRE COUNCIL

PROJECT: BBSTP ROAD UPGRADE

DRAWING TITLE: CONTROL LINE SETOUT PLAN

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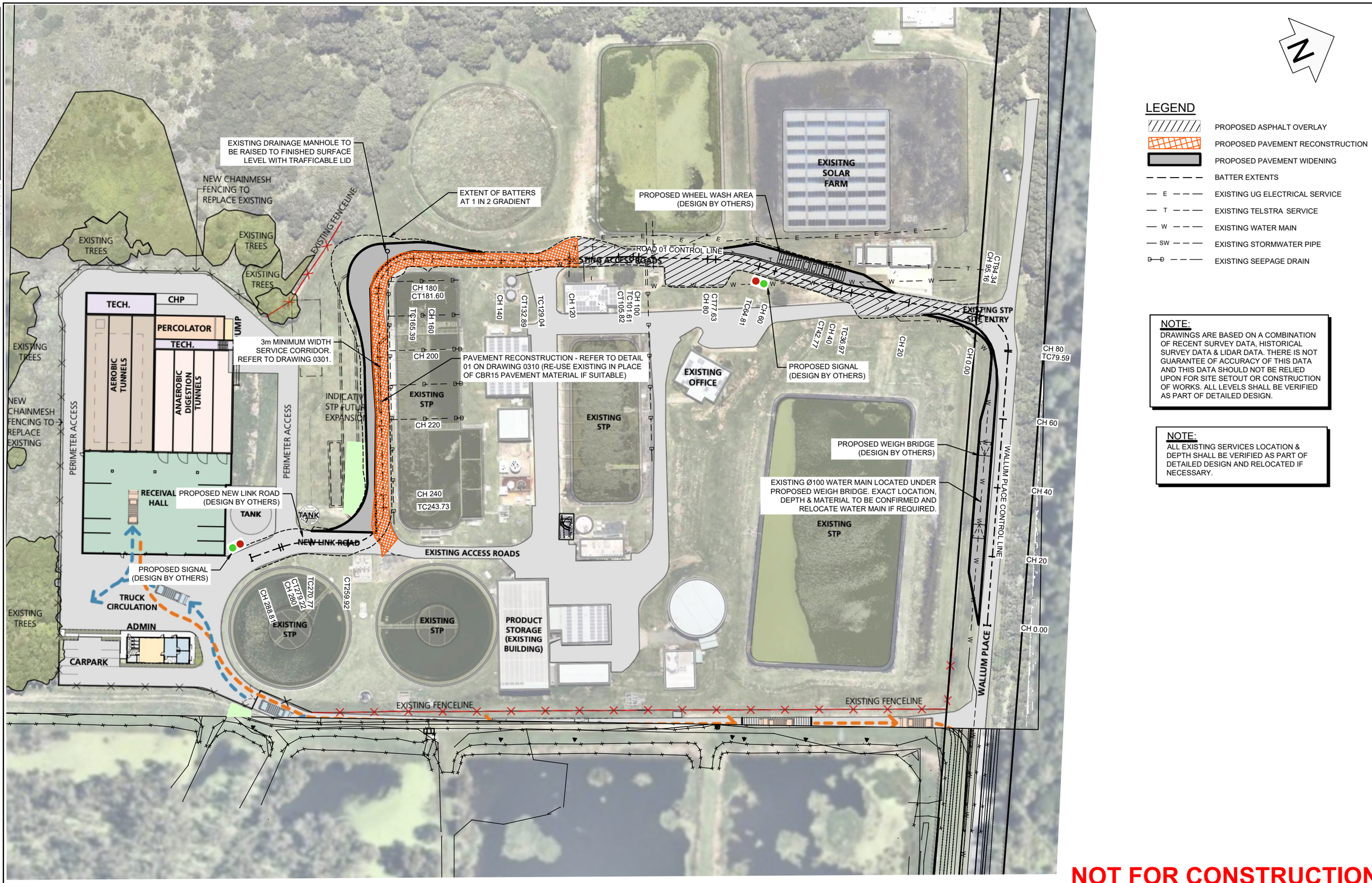

LEGEND

- PROPOSED ASPHALT OVERLAY
- PROPOSED PAVEMENT RECONSTRUCTION
- PROPOSED PAVEMENT WIDENING
- BATTER EXTENTS
- E — EXISTING UG ELECTRICAL SERVICE
- T — EXISTING TELSTRA SERVICE
- W — EXISTING WATER MAIN
- SW — EXISTING STORMWATER PIPE
- D — EXISTING SEEPAGE DRAIN

NOTE:
DRAWINGS ARE BASED ON A COMBINATION OF RECENT SURVEY DATA, HISTORICAL SURVEY DATA & LIDAR DATA. THERE IS NOT GUARANTEE OF ACCURACY OF THIS DATA AND THIS DATA SHOULD NOT BE RELIED UPON FOR SITE SETOUT OR CONSTRUCTION OF WORKS. ALL LEVELS SHALL BE VERIFIED AS PART OF DETAILED DESIGN.

NOTE:
ALL EXISTING SERVICES LOCATION & DEPTH SHALL BE VERIFIED AS PART OF DETAILED DESIGN AND RELOCATED IF NECESSARY.

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Scale (m)

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DESIGN BY: S.AVERKOFF
APPROVED BY:
DATE:
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PO BOX 161
LENNOX HEAD NSW 2478
TELEPHONE: 02 6687 4666
ABN: 20 099 261 711
EMAIL: administration@planitconsulting.com.au

CLIENT: BYRON SHIRE COUNCIL
LOCAL GOVERNMENT AUTHORITY: BYRON SHIRE COUNCIL

PROJECT: BBSTP ROAD UPGRADE
DRAWING TITLE: ROAD LAYOUT PLAN

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Appendix D – Biodiversity Development Assessment Report (Updated)

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Land Eco consulting

Biodiversity Development Assessment Report

New Bioenergy Facility

45 Wallum Place, Byron Bay
New South Wales 2481 Australia

Report prepared for Byron Shire Council

11/01/2022

Report:	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia
Prepared for:	Byron Shire Council
Prepared by:	Land Eco Consulting Pty Ltd
Date:	11/01/2022
Version:	2.2

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Any survey of flora and fauna will be unavoidably constrained in a number of respects. In an effort to mitigate those constraints, we applied the precautionary principle described in the methodology section of this report to develop our conclusions. Our conclusions are not therefore based solely upon conditions encountered at the site at the time of the survey. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Land Eco Consulting has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Land Eco Consulting for use of any part of this report in any other context. The review of legislation undertaken by Land Eco Consulting for this project does not constitute an interpretation of the law or provision of legal advice. This report has not been developed by a legal professional and the relevant legislation should be consulted and/or legal advice sought, where appropriate, before applying the information in particular circumstances. This report has been prepared on behalf of, and for the exclusive use of, the client who commissioned this report, and is subject to and issued in accordance with the provisions of the contract between Land Eco Consulting and the client who commissioned this report. Land Eco Consulting accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party. Land Eco Consulting Pty Ltd has completed this assessment in accordance with the relevant federal, state and local government legislation as well as current industry best practices including guidelines. Land Eco Consulting Pty Ltd accepts no liability for any loss or damages sustained as a result of reliance placed upon this report and any of its content or for any purpose other than that for which this report was intended.

Land Eco Consulting Pty Ltd
www.landeco.com.au
ABN 48 636 918 404

Report Certification

All field survey and reporting for this Biodiversity Development Assessment Report was undertaken by

Kurtis Lindsay *BSc (Hons)*

Principal Ecologist
Accredited Biodiversity Assessor (#BAAS18059)
Land Eco Consulting
kurtis.lindsay@landeco.com.au
Ph: 0408765832

Experience

Kurtis Lindsay is a Principal Ecologist and BAM Accredited Assessor who holds 20 years of flora and fauna survey experience and over 12 years experience as a professional Ecological Consultant.

Document Control

Version	Document Name	Issue Date
Draft v0	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	-
Draft v1	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	26 April 2021
1.0	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	25 May 2021
1.1.1	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	16 June 2021
Draft 2.0	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	02 January 2021
Draft 2.1	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	10 January 2021
Draft 2.2	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	11 January 2021
Final 2.2	Biodiversity Development Assessment Report for Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia	11 January 2022

Contents

Figures

Tables

Plates

Glossary

Acronym/ Term	Definition
AD	Anaerobic Digestion
BAM	The NSW Biodiversity Assessment Method 2020
BAMC	The NSW Biodiversity Assessment Method Calculator
BEF	Bioenergy Facility
BC Act	New South Wales Biodiversity Conservation Act 2016
BCD	Biodiversity and Conservation Division of DPIE
BDAR	Biodiversity Development Assessment Report
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity Offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of development.
Biodiversity values	The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats.
BOS	NSW Biodiversity Offset Scheme
CHP	Combined heat and power unit
DA	Development Application
DCP	Byron Shire Development Control Plan 2014
DBH	Tree stem diameter at breast height (1.37m above ground).
DPIE	NSW Department of Planning, Infrastructure and Environment
Ecosystem credit	A credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ha	Hectare
HTW	High Threat Exotic
km	Kilometre
LEP	Byron Shire Local Environmental Plan 2014
LGA	Local Government Area
Locality	The area within a 10km radius of the Subject Land. The same meaning when describing a local population of a species or local occurrence of an ecological community.
m	metres
MNES	Matters of National Environmental Significance
Native Vegetation	means any of the following types of plants native to New South Wales:(a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland.
NPWS	National Parks and Wildlife Service
NSW	The State of New South Wales
OEH	NSW Office of Environment and Heritage (now known as Department of Planning, Infrastructure and Environment)
PCT	NSW Plant Community Type
Priority weed	Priority weed in the North Coast New South Wales as per the *Biosecurity Act 2015*
Proposal	The development, activity or action proposed.
Remnant	In the context of this report, the term 'remnant' relates to those native canopy trees which are locally indigenous. The term does not suggest the trees are 'old growth' remnant as all of the trees on the Subject Land are regrowth since the land was clear-felled in the past. The term 'remnant' in this report describes the presence of a canopy comprised of locally indigenous trees, it helps to distinguish from those areas that do not contain locally indigenous trees.
SAII	Serious and Irreversible Impacts

Acronym/ Term	Definition
SAII entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs)
DCP	The Hornsby Development Control Plan
SEPP	State Environmental Planning Policy
Species Credit	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require Species Credits are listed in the Threatened Biodiversity Data Collection.
Study Area	The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the proposal.
STP	Sewage Treatment Plant
Subject Land	The location of the proposed activity (Industrial Units development footprint); the subject of this report.
Subject Property	Lot 2/-/DP706286 at 45 Wallum Place, Byron Bay New South Wales 2481 Australia
The proponent	The developer of the property (Byron Shire Council).
Threatened biota	Threatened species, populations or ecological communities listed under the BC Act and/or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 and '*threatened species, population or ecological community*' means a species, population or ecological community specified in any of those Schedules.
VIS Plot	Vegetation Integrity Survey Plot

Executive Summary

Byron Shire Council ('the proponent') is seeking approval for the development of a Bioenergy Facility (BEF) over the centre of Lot 2/-/DP706286 at 45 Wallum Place, Byron Bay, New South Wales 2481to be constructed on land owned and managed by Byron Shire Council.

The Project is being assessed as a designated development under the *Environmental Planning and Assessment Act 1979*. This Biodiversity Development Assessment Report (BDAR) has been prepared for the Project in accordance with the requirements of the *Biodiversity Conservation Act 2016* (BC Act) and the Biodiversity Assessment Method (BAM). This BDAR documents the results of the biodiversity assessment carried out for the development in line with the relevant threatened species legislation and policy.

This revised BDAR (version 2.0) supersedes the previous version (version 1.1). Version 2.0 incorporates significant design changes intended to reduce biodiversity impacts the most significant being the relocation of the proposed access road away from artificial wetland habitat areas. Byron Shire Council acknowledges the suggestions of Byron Bird Buddies and BirdLife Northern Rivers in these design modifications which will further reduce indirect impacts to biodiversity, especially wetland birds.

The development site is located in the local government area (LGA) of Byron Shire, in the South East Queensland (IBRA 7) and the Burringbar-Conondale Ranges subregion. The study area is situated in a predominantly cleared landscape in an existing, operational Sewage Treatment Plant that has highly modified vegetation and habitat which is mostly dominated by exotic grassland. Less modified native vegetation is situated to the south, west and east of the site.

The proposed development will require clearing of a maximum of 0.36 hectares of non-native vegetation comprised of weed-dominated pastures, and 0.52 hectares of plant community type (PCT) *1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion*.

The total extent of PCT 1064 on the development site is limited to derived, maintained grassland (lawn) which is dominated by common, native grasses, most notable *Paspalum distichum*. No remnant or regrowth area of PCT 1064 will be cleared to facilitate the development. Not a single tree will be cleared to facilitate the development.

The condition of PCT 1064 was extremely poor. The vegetation integrity score (VIS) was 2.4. In accordance with section 9.2.1 of the BAM, native vegetation that yields a VIS lower than 17 does not need to be offset where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.

No threatened ecological communities were identified in the development site. PCT 1064 may qualify as Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions endangered ecological community (EEC) under the BC Act, however, no extent of this community in the development site qualified to be assessed as this EEC.

Targeted threatened fauna surveys were carried out in January, March and April 2021. These surveys revealed the presence of four species credit threatened fauna species:

- *Crinia tinnula* (Wallum Froglet) (BC Act: Vulnerable)
- *Litoria olongburensis* (Wallum Sedge-frog) (BC Act: Vulnerable; EPBC Act: Vulnerable)
- *Thersites mitchellae* (Mitchell's Rainforest Snail) (BC Act: Endangered/SAII; EPBC Act: Critically Endangered)
- *Myotis macropus* (Southern Myotis) (BC Act: Vulnerable)

An additional species credit species had been historically recorded in close proximity to the Subject Land and therefore was assumed present:

- *Planigale maculata* (Common Planigale) (BC Act: Vulnerable)

No threatened flora species were recorded in or near the proposed development site.

A suite of ecosystem credit species were recorded flying-over the proposed development site, or utilising nearby wetland habitat.

The potential for direct impacts to biodiversity is limited to clearing of derived grassland native vegetation and associated habitat. The development will not impact any areas of land that the NSW Minister for Energy and Environment has declared as an area of outstanding biodiversity value in accordance with Section 3.1 of the BC Act.

Indirect impacts such as noise, vibration, lighting, dust, stormwater, wastewater, acid sulphate soils exposure/treatment and vehicle strike have all been managed through appropriate impact mitigation measures incorporated into the design, construction and operation of the project.

Once all practicable steps to avoid or minimise impacts have been implemented at the detailed design phase, mitigation and management measures will be implemented to further lessen the potential ecological impacts of the development.

Residual impacts to species credit species will be offset through Council's decision to directly fund several conservation actions to enhance biodiversity conservation in proximity to the proposed development.

The proposed development is considered to be of low biodiversity impact while the benefits that the proposed development will bring to Byron Shire are considerable. Subject to effective implementation of the impact mitigation and offset requirements of this BDAR, the development should proceed to approval and implementation.

1. Introduction

Land Eco Consulting (Land Eco) was commissioned by Skala Australasia Pty Ltd on behalf of Byron Shire Council ('the proponent') to prepare this Biodiversity Development Assessment Report (BDAR) to section 7.7 of the NSW Biodiversity Conservation Act 2016 for the proposed development of a Bioenergy Facility over a portion of the land comprising the Byron Bay Sewage Treatment Plant located Lot 2/-/DP706286 at 45 Wallum Place, Byron Bay, New South Wales 2481. This BDAR addresses the requirements relating to '*Biodiversity*' and '*NPWS Estate (land reserved acquired under the National Parks and Wildlife Act 1974)*' of the "*Biodiversity and Conservation Division's Recommended Environmental Assessment Requirements (EARs) for Preparation of an Environmental Impact Statement* for the Byron Bay Bioenergy Facility" which was attached to a letter written by Dimitri Young, Senior Team Leader Planning, North East Branch of NSW Department of Planning Industry & Environment (DPIE) Biodiversity and Conservation Division (BCD) originally dated 25 June 2020, with an updated version of the same letter signed by Dimitri Young and dated 1 April 2021.

This BDAR addresses the requirements of the NSW Biodiversity Offset Scheme (BOS), written requests of the BCD, and Councils-own Local Environmental Plan (LEP) and Development Control Plan (DCP).

1.1 Addressing Relevant Requirements of EIS

1.1.1 Biodiversity Requirements

The BCD Recommended EAR's – EIS – Byron Bay Bioenergy Facility (1 April 2021) provides a list of minimum requirements for the biodiversity assessment component of the EIS. Those requirements are summarised in (**Table 1**).

Table 1. Biodiversity Assessment Requirements of the BCD

BCD Requirement	BCD Page Reference (1 April 2021)	Addressed in this BDAR
Our examination of threatened species records for the locality within which the development is proposed indicates the follow species have been recorded previously: • Black-necked Stork • Comb-crested Jacana • Mitchell's Rainforest Snail • Rose-crowned Fruit-dove • White-bellied Sea-eagle • Olongburra Frog • Eastern Grass Owl • Koala • Wallum Froglet • Magpie Goose • Long-nosed Potoroo	4 of 11	This BDAR includes detail of targeted survey and assessment for all the listed Ecosystem Credit Species (section 4.2) and Species Credit Species (section 4.3). Impacts are detailed in section 5. and mitigation measures are detailed in section 6.
1. The EIS must assess the impacts of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the Biodiversity Conservation Act 2016 (BC Act) as follows:	4 of 11	This report assess the impacts of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" Relevant Tests of Significance pursuant to Section 7.2 and 7.3 of the BC Act are presented (**Appendix E**).
A. The EIS must demonstrate whether the proposed development is to be carried out in a declared area of outstanding biodiversity value	4 of 11	The proposed development will not be carried out in a declared area of outstanding biodiversity value.
B. If the proposed development is not carried out in a declared area of outstanding biodiversity value, then the EIS must demonstrate and document whether the proposed development exceeds the biodiversity offset scheme threshold, as set out in section 7.4 of the BC Act	4 of 11	See section 1.4.

BCD Requirement	BCD Page Reference (1 April 2021)	Addressed in this BDAR
and clause 7.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation), by determining whether the proposed development involves:		
I. The clearing of native vegetation of an area declared by clause 7.23 of the BC Regulation as exceeding the threshold. or	4 of 11	See section 1.4.
II. The clearing of native vegetation, or other action prescribed by clause 6.1 of the BC Regulation, on land included on the Biodiversity Values (BV) Map published under clause 7.3 of the BC Regulation.	4 of 11	See section 1.4.
C. If the biodiversity offset scheme (BOS) threshold is not exceeded, then the EIS must document the test for determining whether the proposed development is likely to significantly affect threatened species or ecological communities as outlined in Section 7.3 of the BC Act, by preparing an ecological assessment that should include:	4 of 11	The BOS was not triggered from the BV Map, area clearing threshold nor significant impact criteria. Council opted into preparing this BDAR. Relevant Tests of Significance pursuant to Section 7.3 of the BC Act are presented (**Appendix E**).
I. A field survey of the site conducted and documented in accordance with relevant guidelines, including:	4 of 11	See section 1.5.
a. Field survey methods for environmental consultants and surveyors when assessing proposed developments or other activities on sites containing threatened species	5 of 11	See section 1.5.
b. Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC 2009)	5 of 11	See section 1.5, section 4.2 and section 4.3.
c. NSW Guide to Surveying Threatened Plants (OEH 2016	5 of 11	See section 1.5 and section 4.4.
d. "Species credit' threatened bats and their habitats	5 of 11	See section 1.5, section 4.2 and section 4.3.
e. Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004)	5 of 11	See section 1.5, section 4.2 and section 4.3.
The list of potential threatened species, populations, ecological communities, or their habitats for the site should be determined in accordance with:	5 of 11	See section 1.5, section 3, section 4.2 and section 4.3, and section 4.4.
The Threatened Biodiversity Survey and Assessment: Guidelines for Development Activities – Working Draft (DEC 2004)	5 of 11	See section 1.5, section 4.2 and section 4.3, and section 4.4.
The Department's Threatened Species website	5 of 11	See section 1.5, section 4.2 and section 4.3, and section 4.4.
The Bionet Atlas of NSW	5 of 11	See section 1.5, section 4.2 and section 4.3, and section 4.4.

BCD Requirement	BCD Page Reference (1 April 2021)	Addressed in this BDAR
The Vegetation Information System (BioNet Vegetation Classification), and	6 of 11	See section 3.
Other data sources (e.g., PlantNet, Online Zoological Collections of Australian Museums) (www.ozcam.org), previous or nearby surveys etc) may also be used to compile the list.	6 of 11	See section 1.5, section 3, section 4.2 and section 4.3, and section 4.4.
II. The following as a minimum:	6 of 11	
a. A description, spatial data files, and geo-referenced mapping of the study area, (overlays on topographic maps, satellite images and/or aerial photos, including details of map datum, projection and zone). Showing all field survey locations, vegetation communities classified in accordance with the BioNet Vegetation Classification, key habitat features and reported locations of threatened species and ecological communities present in the subject site and study area.	6 of 11	All figures presented in this BDAR are produced using spatial datafiles, georeferenced mapping, topography overlaid on aerial imagery. These data layers are described and labelled accordingly on each corresponding figure.
b. A description of survey methodologies used, including timing, location and weather conditions	6 of 11	Section 1.5.1.
c. Details, including qualifications and experience, of all staff undertaking the surveys, mapping and assessment of impacts as part of the EIS.	6 of 11	Report Certification
d. Identification of national and state listed threatened biota known or likely to occur in the study area and their conservation status	6 of 11	See section 1.5, section 3, section 4.2 and section 4.3, and section 4.4.
e. A description of the likely impacts of the proposed development on biodiversity values, including direct and indirect impacts and construction and operation impacts, with impacts quantified, wherever possible, such as the amount of each vegetation community or species habitat to be cleared or impacted, and/or the degree of fragmentation of a habitat connectivity.	6 of 11	See section 5.
f. Identification of the avoidance, mitigation and management measures that will be put in place as part of the proposed development to avoid or minimise biodiversity impacts, including details about alternative options considered and how long-term management arrangements will be guaranteed.	6 of 11	See section 1.3 and section 6.

BCD Requirement	BCD Page Reference (1 April 2021)	Addressed in this BDAR
g. A description of the residual impacts of the proposed development	6 of 11	See section 5.
III. The 'test for determining whether propose development or activity is likely to significantly affect threatened species or ecological communities, or their habitats' as outlined in Section 7.3 of the BC Act undertaken in accordance with the gazetted Threatened Species Test of Significance Guidelines (OEH 2018).	6 of 11	The BOS was not triggered from the BV Map, area clearing threshold nor significant impact criteria. Council opted into preparing this BDAR. Relevant Tests of Significance pursuant to Section 7.3 of the BC Act are presented (**Appendix E**).
2. If the EIS determines under 1 above that the proposed development is likely to significantly affect threatened species, then in accordance with Section 7.7. of the BC Act, the EIS must be accompanied by a Biodiversity Development Assessment Report prepared in accordance within Part 6, Division 3 of the BC Act.	6 of 11	The BOS was not triggered from the BV Map, area clearing threshold nor significant impact criteria. Council opted into preparing this BDAR.
3. If the EIS determines under 1 above that the proposed development is unlikely to significantly affect threatened species, then the proposed development should: a. Be designed to avoid and minimise impacts on biodiversity values to the fullest extent possible, and b. Include a biodiversity offset package to offset remaining direct and indirect impacts on biodiversity values.	6 of 11	This BDAR details the how the development was designed to avoid and minimise impacts on biodiversity values to the fullest extent possible (see section 1.3 and section 6.) A biodiversity offset package is provided to offset the remaining direct and indirect impacts upon biodiversity values is detailed in this BDAR, see section 8.
Note: For the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, the EIS should identify any relevant Matters of National Environmental Significance (MNES) and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action.	The proposal has been referred to the Commonwealth and it was concluded that the activity will not cause a significant impact upon any MNES. An assessment of Impact Significance of the proposal upon MNES has been prepared (Land Eco 2021).	

1.1.2 NPWS Estate

The BCD Recommended EAR's – EIS – Byron Bay Bioenergy Facility (1 April 2021) provides a list of minimum requirements for the NPWS Estate assessment component of the EIS. Those requirements are summarised in (**Table 2**).

Table 2. NPWS Estate Assessment Requirements of the BCD

BCD Requirement	BCD Page Reference (1 April 2021)	How Addressed in this BDAR
The EIS should address the following with respect to land reserved under the National Parks and Wildlife Act 1974	8 of 11	Impacts of the development upon the NPWS Estate are addressed (**section 7.5**)
1. Where appropriate, likely impacts (both direct and indirect) of the proposed development on any adjoining and/or nearby NPWS estate reserved under the National Parks and Wildlife Act 1974 should be considered, with reference to the Developments adjacent to National Parks and Wildlife Service lands Guidelines for consent and planning authorities (DPIE 2020).	8 of 11	

1.2 Description of Proposal

Land Eco Consulting (Land Eco) was commissioned by Skala Australasia on behalf of Byron Shire Council ('the proponent') to prepare this Biodiversity Development Assessment Report (BDAR) pursuant to section 7.7 of the NSW Biodiversity Conservation Act 2016 for the proposed development of an for a proposed Bioenergy Facility on Lot 2/-/DP706286 at 45 Wallum Place, Byron Bay (hereafter referred to as 'the Subject Property') (**Figure 1**).

Land Eco have produced this report to assess any potential impacts associated with the DA and recommend appropriate measures to avoid, minimise, mitigate and offset any potential ecological impacts in line with the requirements of the regulatory authorities, Byron Shire Council and the NSW Department of Planning Industry and Environment (DPIE) Environment Energy and Science (EES).

1.2.1 Proposed Development

The proposed development will involve the construction and operation of a best practice Bioenergy Facility (BEF) receiving organic waste materials from households and businesses in the Byron and neighbouring local government areas. The facility will be enclosed and operate under negative pressure to ensure all emissions from the process are treated before release. Biogas will be collected and consumed onsite to generate electricity. No biogas will be exported from the site.

A site plan providing an overview of the proposed development and operations is given in **Figure 2** Key operational features of the development footprint includes:

- A Receival Hall;
- Four Anaerobic Digestion Tunnels with gas storage;
- Three Aerobic Composting Tunnels
- A Biofilter;
- A Percolate Storage Tank with sand filter;
- A Combined Heat and Power (CHP) unit with gas treatment and flare;
- Office and education facilities; and
- A car park to assist in traffic flow on the site.
- truck circulation area,
- access roads,
- and a weighbridge.

The existing STP biosolids storage area will be repurposed to store products from the BEF.

The proposed dry Anaerobic Digestion (AD) technology for the BEF is a BEKON dry fermentation batch process that transforms solid organic waste into organic digestate while producing biogas which can be turned into electricity and heat. Four AD tunnels and three aerobic composting tunnels are required to process up to 28,000 tonnes/year. While the waste material sits inside

the tunnel for approximately three weeks, biogas is produced and brought to the combined heat and power unit (CHP) via a gas storage facility. The latter serves to even out the biogas quality and bridge maintenance works at the CHP. Before the biogas enters the CHP, it is cooled, compressed, and run through an activated carbon filter if required.

After approximately 3 weeks have passed, the tunnel is once again purged with exhaust gas from the CHP to displace any remaining biogas in the tunnel. Once there is virtually no biogas left, the tunnel door is opened and the digestate will be taken out of the tunnel by front loader and temporarily stored in the Receival Hall. Any residual gas escaping into the Receival Hall will be collected for treatment through the biofilter.

The digestate will be further stabilised using 3 weeks of aerobic composting in tunnels followed by screening. Upon discharge from the screen, the product will be transferred by tipper truck to the (former) biosolids covered storage area located within the adjacent STP for storage and later dispatch. Up to 2 weeks of compost production (600 tonnes) may be stored in the Receival Hall. A minimum of 2 weeks product storage (600 tonnes or 1,000 m^3) will also be available in the (former) biosolids covered storage area located within the adjacent STP.

The BEKON Dry Fermentation Process is designed to reduce liquid excess as much as possible. Nevertheless, during the process, it is possible that some surplus liquid (percolate) will be generated. Using percolate to inoculate each newly filled tunnel is likely to enable a neutral water balance for the facility. Surplus percolate can be recycled within the AD process. The BEF can store percolate excess for up to six months, allowing for infrequent disposal at the most opportune time if required.

Electricity generated by the BEF will be utilised to power the BBSTP and the BEF itself, thereby offsetting electricity costs for the plant.

1.2.2 Description of Biodiversity Impact

The proposed development will require the clearing of approximately 0.52 ha of historically cleared vegetation. No remnant vegetation will be impacted for the proposed development to proceed. The majority of the Subject Land consists of non-native vegetation, the majority being pasture grasses and forbs. The severity of weed infestation varies across the site, from moderate to severe. None of the native vegetation in the Subject Land is considered to be in good condition.

Ecologist targeted surveys revealed the presence of three threatened fauna species within the Subject Land:

- *Crinia tinnula* (Wallum Froglet) (BC Act: Vulnerable)
- *Litoria olongburensis* (Wallum Sedge-frog) (BC Act: Vulnerable; EPBC Act: Vulnerable)
- *Thersites mitchellae* (Mitchell's Rainforest Snail) (BC Act: Endangered; EPBC Act: Critically Endangered).

The two frog species were found in the remnant wetland east and west of the Subject Land, Mitchell's Rainforest Snail was found in the south-western corner of the proposed development footprint.

No threatened flora species were identified in or adjacent the Subject Land.

Table 3. Area of Native Vegetation Impacted to Facilitate Development

Area of Native Vegetation on Subject Land	Area of Native Vegetation to be removed from Subject Land for Development	Area of Native Vegetation to be Retained (ha) on Subject Land post Development
0.52 ha	0.52 ha	All remnant native vegetation located near the development has been deliberately excluded and avoided following the principles of avoid and minimise.

1.2.3 Site Description and Location

The proposed lot is located on the southern side of Wallum Place, west of Bayshore Drive, within the BBSTP. The development site is immediately to the south and west of existing infrastructure within the BBSTP. The site comprises a small area of the land contained in Lot 2, DP 706286.

The Subject Property consists of a single large lot which is predominantly vegetated with remnant vegetation associated with dune fields. The area to the north and south of the proposed development is the Byron Bay Sewage Treatment Plan and associated settling ponds, some of these ponds function as wetlands. Natural Melaleuca and Wallum Swamp wetlands also occur in proximity to the development. Most of the vegetation in the Subject Property comprises the 'West Byron BioBanking Agreement Site'.

The lot includes three existing developments:

- a sewage treatment plant, owned and operated by BSC;
- a solar array and supporting infrastructure, owned and operated by BSC; and
- a herb nursery, operated by Byron Bay Herb Nursery a not for profit disability service charity

The BBSTP was opened in 1989 and licensed by the NSW EPA in July 2000. The solar array was granted consent by BSC in August 2019 (DA 10.2019.216.1), with an occupation certificate issued in January 2020.

The operation of the herb nursery is consistent with the zoning and did not require development consent. No previous development application has been made for a BEF or similar organic recycling facility.

Figure 1. The location of the Subject Property and Subject Land

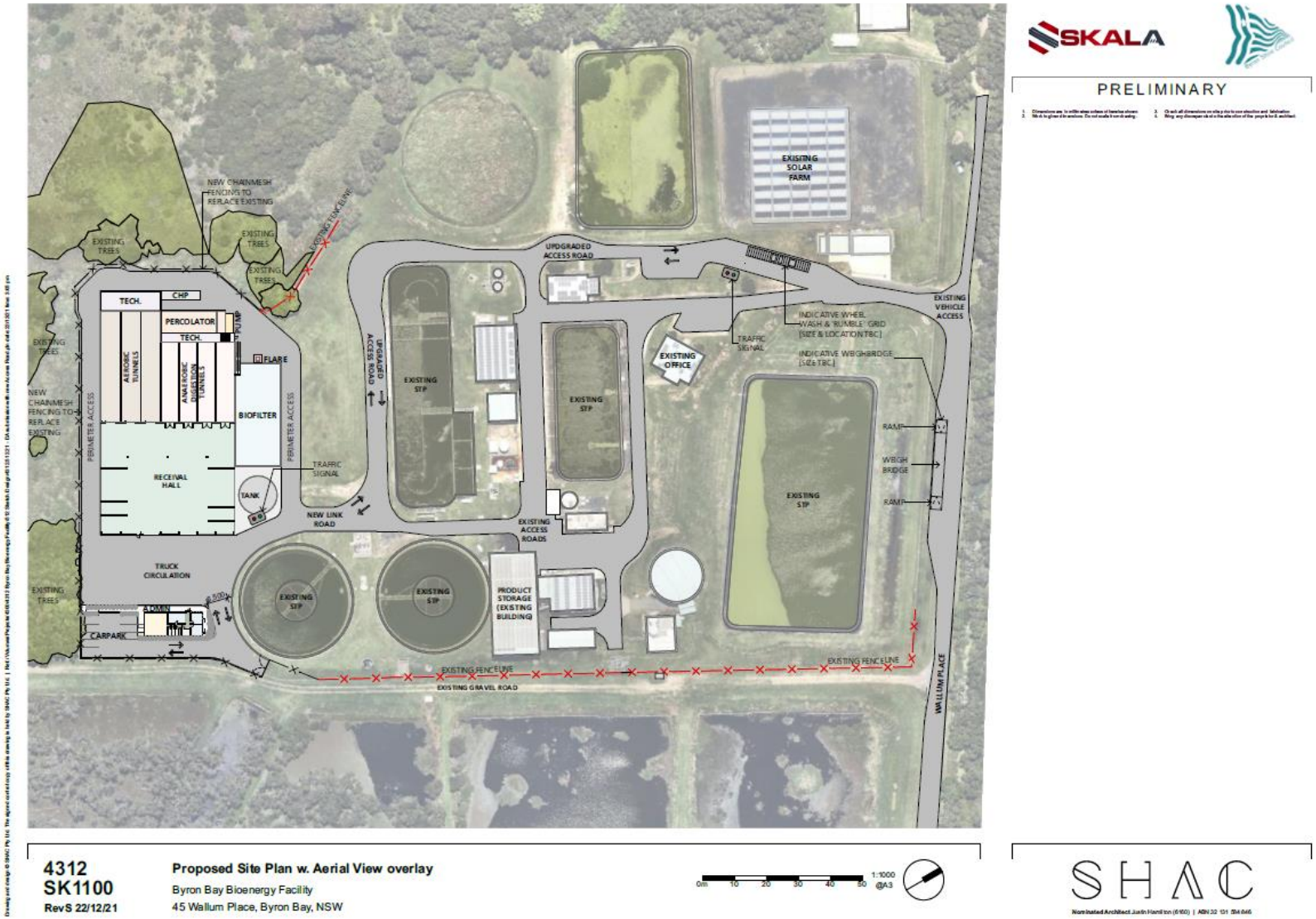

Figure 2. Proposed Development Layout (SHAC 2021)

1.3 Avoid and minimise impacts (location and design)

The proposed development is for a new industrial facility to be situated within the compound of an existing industrial facility, the Byron Bay Sewage Treatment Plant. The Subject Property is extensive and covers large extents of native vegetation and wetland. A small proportion of the Subject Property is occupied by the Sewage Treatment Plant compound, and a small proportion of this compound is being developed for the proposed development.

There is no remnant native vegetation in the Subject Land. The most significant patches of native vegetation in the locality of the Subject Property are small patches of mature Melaleuca Swamp which occurs outside of the proposed development, to the south-western and south-eastern corners respectively. These patches are dominated by fragmented remnant native vegetation that is floristically diverse, and structurally complex. The original development design required the clearing of these patches, however, in order to meet the principles of 'Avoid and Minimise', the design was altered at the expense of the applicant to avoid clearing this vegetation.

The retention and protection of all trees surrounding the Subject Land has been confirmed by an experienced, qualified Consulting Arborist (Northern Tree Care 2021).

Between the Subject Land and the native vegetation (wetlands) to the west, a buffer of derived exotic grasslands occurs. This is dominated by the introduced pasture, *Setaria sphacelata* with a low density of native fern, sedges and herbs.

The proposed development has been deliberately positioned away from the 'West Byron Biobanking Agreement Site'. The Subject Land is separated by the Biobanking Agreement site by approximately 100 metres of native vegetation comprised mostly of wetlands.

1.4 Triggering the Biodiversity Offset Scheme

This development does not trigger the NSW 'Biodiversity Offset Scheme' (BOS) as it will not significantly impact any threatened species or ecological communities, it does not exceed any vegetation area clearing threshold and it does not require any clearing of native vegetation or threatened species habitat mapped on the NSW Biodiversity Values Map (BV Map). Council opted-in to preparing this BDAR as it enables Council to act in accordance with industry best practice above-and-beyond Council intent.

The BC Act and its regulations stipulate native vegetation clearing 'area threshold' values that determine whether a development is required to be assessed in accordance with the BOS. Minimum entry thresholds for native vegetation clearing are stipulated in the Biodiversity Assessment Method (BAM) 2020 (DPIE 2020) and depend on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan [LEP]), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP). Vegetation clearing includes all felling, slashing, or mowing of native trees, shrubs, or groundcover for the purpose of construction, landscaping, excavation or bushfire Asset Protection Zone (APZ) works.

Developments that trigger the Biodiversity Offset scheme will require a 'Biodiversity Development Assessment Report' (BDAR) that is produced by an Accredited Assessor in accordance with the BAM and usually results in the requirement to retire Biodiversity Credits.

There is no minimum lot size assigned to the Subject Property, so according to the BAM actual lot size (104 ha) is the determinant for area clearing threshold. The lot size places the property in the 40 ha to less than 1000 ha' which means all developments have a vegetation clearing threshold of >1ha (**Table 4**) before triggering the NSW BOS. The development does not involve clearing of more than 1ha this means:

- The area threshold does not trigger the BOS for this development,
- If the BOS is triggered from other means, the development would be assessed as a 'Streamlined Assessment (Small Areas) in accordance with Appendix C of the BAM 2020.

Table 4. Area Clearing Threshold as per Biodiversity Offsets Scheme entry requirements (OEH 2018)

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

Another trigger for the BOS is the clearing of native vegetation from areas mapped 'purple' on the Biodiversity Values (BV) Map (**Figure 3**). The proposed development requires no clearing of native vegetation from within an area mapped on the BV Map. The proposed clearing of native vegetation from the BV Map has not triggered the BOS and is not the reason why this BDAR was produced. The decision to prepare a BDAR was self-elected by the applicant, Council opted in to producing this BDAR.

A review of the project and biodiversity impacts undertaken by the BCD was undertaken and in a letter to Byron Shire Council dated 20 October 2021 (**Appendix F**). The BCD agreed that the proposed development is not likely to significantly impact upon biodiversity such that the Biodiversity Offset Scheme (BOS) would not be triggered. The BCD endorsed Byron Shire Council's Decision to opt-in to the BOS and produce a BDAR however, the BCD advised Council that when a Council opts-in to the BOS there is no requirement to meet any biodiversity offset credit retirement obligation.

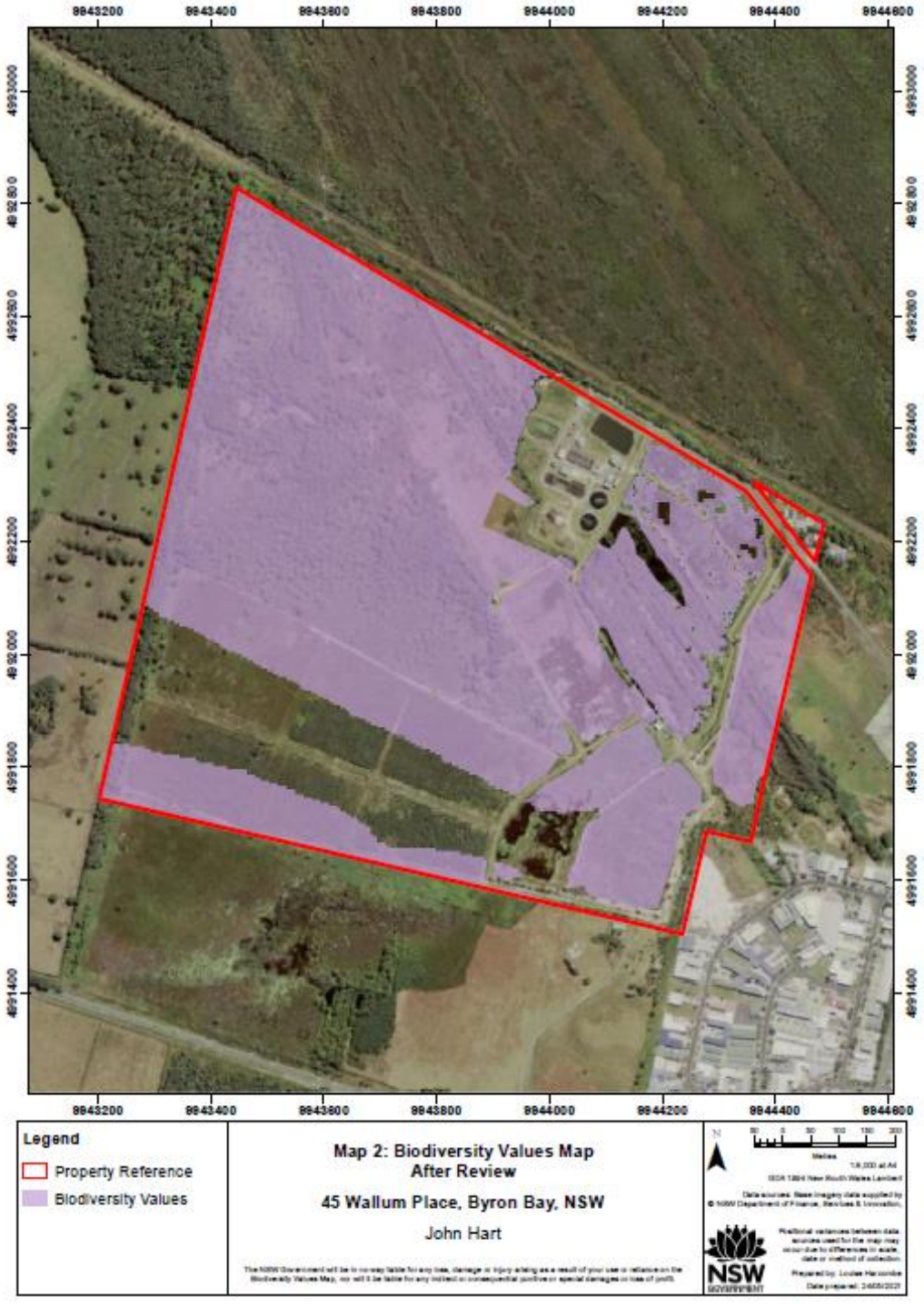

Figure 3. The Subject Property in relation to mapped biodiversity values (DPIE 2021e)

1.5 Aim and Approach

This report has been prepared in accordance with the Biodiversity Assessment Method (DPIE 2020) 'Appendix C: Streamlined assessment module – Small area' and aims to:

- Describe the biodiversity values present within the Subject Land and surrounding area, including the extent of native vegetation, vegetation integrity and the presence of threatened ecological communities (TECs);
- Determine the habitat suitability within the Subject Land for candidate threatened species;
- Prepare an impact assessment regarding potential impacts of the proposed development on biodiversity values, including potential prescribed impacts and serious and irreversible impacts (SAIIs) within the Subject Land;
- Identify and discuss efforts to avoid and minimise impacts on biodiversity values; and
- Calculate the biodiversity credits (i.e. ecosystem credits and species credits) that measure potential impacts of the development on biodiversity values. This calculation will inform the decision maker of the number and class of offset credits required to be purchased and retired as a result of the proposed development.

This development is assessed under the streamlined assessment module 'small area' in accordance with BAM Appendix C. Under this module assessment of species credit species is only required for species credit species that are SAII entities, or species credit species that were incidentally recorded within the Subject Land.

1.5.1 Field Survey Methods

Vegetation mapping, VIS plot sampling and targeted threatened species surveys were carried out by Principal Ecologist, Kurtis Lindsay on:

- 27 January 2021,
- 16 - 18 February 2021, and
- 23 - 27 March 2021
- 15 November 2021

The field survey of the site was conducted in accordance with relevant guidelines, including:

- Field survey methods for environmental consultants and surveyors when assessing proposed developments or other activities on sites containing threatened species (OEH 2004)
- Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC 2009)
- NSW Guide to Surveying Threatened Plans (OEH 2016
- "Species credit' threatened bats and their habitats
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004)
- BioNet Threatened Species Profiles

The BAM 2020 does not require targeted survey of ecosystem credit species because all ecosystem credit species that are predicted to occur in the Subject Land in the BAM Calculator, or are known occur within 10km of the Subject Land (as per BioNet Wildlife Atlas (DPIE 2021c) are assumed present in the Subject Land.

Despite not being a requirement of the BAM 2020, Land Eco carried-out targeted surveys for all of the ecosystem credit species in order confirm any utilisation of the habitat present within or immediately surrounding the Subject Land (**Table 11**). The following species (among others) were all surveyed for through incorporation of targeted survey effort:

- Black-necked Stork
- Comb-crested Jacana
- Mitchell's Rainforest Snail
- Rose-crowned Fruit-dove
- White-bellied Sea-eagle
- Olongburra Frog
- Eastern Grass Owl
- Koala
- Wallum Froglet
- Magpie Goose
- Long-nosed Potoroo

The field survey methods and effort utilised for survey of species credit threatened species are provided (**Table 13**). As this BDAR was produced in accordance with the BAM 2020 '*Appendix L: Requirements for a Biodiversity Development Assessment Report – Streamlined assessment modules Table 27 Minimum information requirements for the Biodiversity Development Assessment Report: Streamlined assessment module – Small area Streamlined – Small Area*' targeted surveys were only undertaken for species credit species that have been identified in BioNet as 'Serious and Irreversible Impact' (SAII) entities. All species credit species that had been previously recorded within the Subject Land or were recorded opportunistically during the field surveys component of this study were included in the list of species to assess and offset.

Weather observations for the locality experienced during the survey period were obtained from the Australian Bureau of Meteorology (BOM) 2021. This weather data is summarised in **section 4.5**.

Detail methods are provided as follows:

1. Ecosystem Credit Fauna Species survey effort and timing (**section 4.2**)
2. Species Credit Fauna Species survey effort and timing (**section 4.3)**
3. Species Credit Flora Species (**section 4.4**).

2. Landscape

2.1 IBRA Bioregions and Subregions

The Subject Land occurs within the '*South Eastern Queensland*' Interim Biogeographic Regionalisation for Australia version 7 (IBRA) bioregion, and '*Burringbar-Conondale Ranges*' IBRA subregion (DEE 2016; **Figure 4** and **Figure 5**).

2.2 Mitchell Landscapes

NSW Landscapes Mapping: Background and Methodology (Mitchell 2002; OEH 2016a) groups ecosystems into meso-ecosystems representing larger natural entities based on topography and geology. The naming of ecosystems and meso-ecosystems was standardised so that each name provided location information and a meaningful descriptive landscape term.

The Subject Land occurs on a transition zone of the following two Mitchell Landscapes (**Figure 5**):

- '*Byron – Tweed Coastal Barriers*'
- '*Byron – Tweed Alluvial Plains*'

2.2.1 Landscape Ecosystem – Byron - Tweed Coastal Barriers

Beaches, dunes, swamps and lagoons on Quaternary coastal sands, with inner and outer barrier dune sequences, general elevation 0 to 25m, local relief 10 to 20m. Essentially similar landscape pattern as the Clarence - Richmond Barriers and Beaches Landscape but with a greater proportion of swamp, shifts in common plant species and large areas of littoral closed forest with abundant vines and occasional epiphytes (Mitchell 2002).Landscape Features

This section details the landscape features and associated habitat values in and around the Subject Land. A table is provided which details the Landscape Features as required by the BAM **(Table 5)**.

2.2.2 Soils and Geology

Historical Soil Landscape Mapping (Morand 2009) have identified the land comprising the northern portion of the Subject Property and surrounds as 'Black Rock' Soil Landscape (Morand 2009). This is defined by extremely low level to gently undulating beach ridge plains on Pleistocene beaches and dune sand. Elevation and relief are 1–2 m, slopes <5%. The topography is characterised by dune/swale systems aligned parallel to the coast. Dunes are very low (<3 m) and narrow to moderately broad (20–500 m), swales narrow to moderately broad (100–500 m). Dry and wet heathland occurs in dunes and swales respectively.

2.2.3 Hydrology - Rivers, Streams and Wetlands

There are no mapped watercourses or riparian corridors in or immediately around the Subject Land (**Figure 6**). The nearest mapped watercourses are located over 300 metres from the Subject Land. These unnamed watercourses flow north into Simpson's Creek which flows to the Brunswick River.

Table 5. Landscape features identified within the Subject Land and surrounding 1500m buffer.

Landscape Feature	Identification of Landscape Feature on Site
Native vegetation cover in 1500m buffer area	A 1500m 'assessment circle' surrounding the outside edge of the boundary of the Subject Land was prepared in order to determine the extent of native vegetation within the surrounding locality of the Subject Land. Native vegetation was considered to cover approximately 565 ha of the total 813 ha area within the 1500m buffer, this corresponds with the >70% vegetation cover class.
Rivers and Streams (classified according to stream order)	There are no mapped watercourses or riparian corridors in or immediately around the Subject Land (Figure 6). The nearest mapped watercourses are located over 300 metres from the Subject Land. These unnamed watercourses flow north into Simpson's Creek which flows to the Brunswick River.
Wetlands (within, adjacent to and downstream of site)	The Subject Land is located within an area mapped 'proximity area for coastal wetland' (**Figure 6**) as defined under the State Environmental Planning Policy (Coastal Management) 2018 which is one of the reasons for the designated development status of the proposal. The BEF has been designed in a manner that avoids impacts to the adjacent coastal wetlands. See
Connectivity features	The identified area of habitat connectivity between the Subject Land and native vegetation within the 1500m buffer zone has the potential to provide habitat for a number of threatened species, endangered populations and migratory species. There is the potential that 'flyways' used by a suite of both terrestrial and migratory avian species encompass the Subject Land as well as a land within the 1500m buffer zone.
Areas of geological significance and soil hazard features	No areas of geological significance (karsts, caves, crevices or cliffs) were identified within the Subject Land. This was determined as a result of a comprehensive site-based assessment.
Areas of Outstanding Biodiversity Value (AOBV)	The Subject Land contains no AOBV. There is no AOBV situated in the area surrounding the Subject Land.

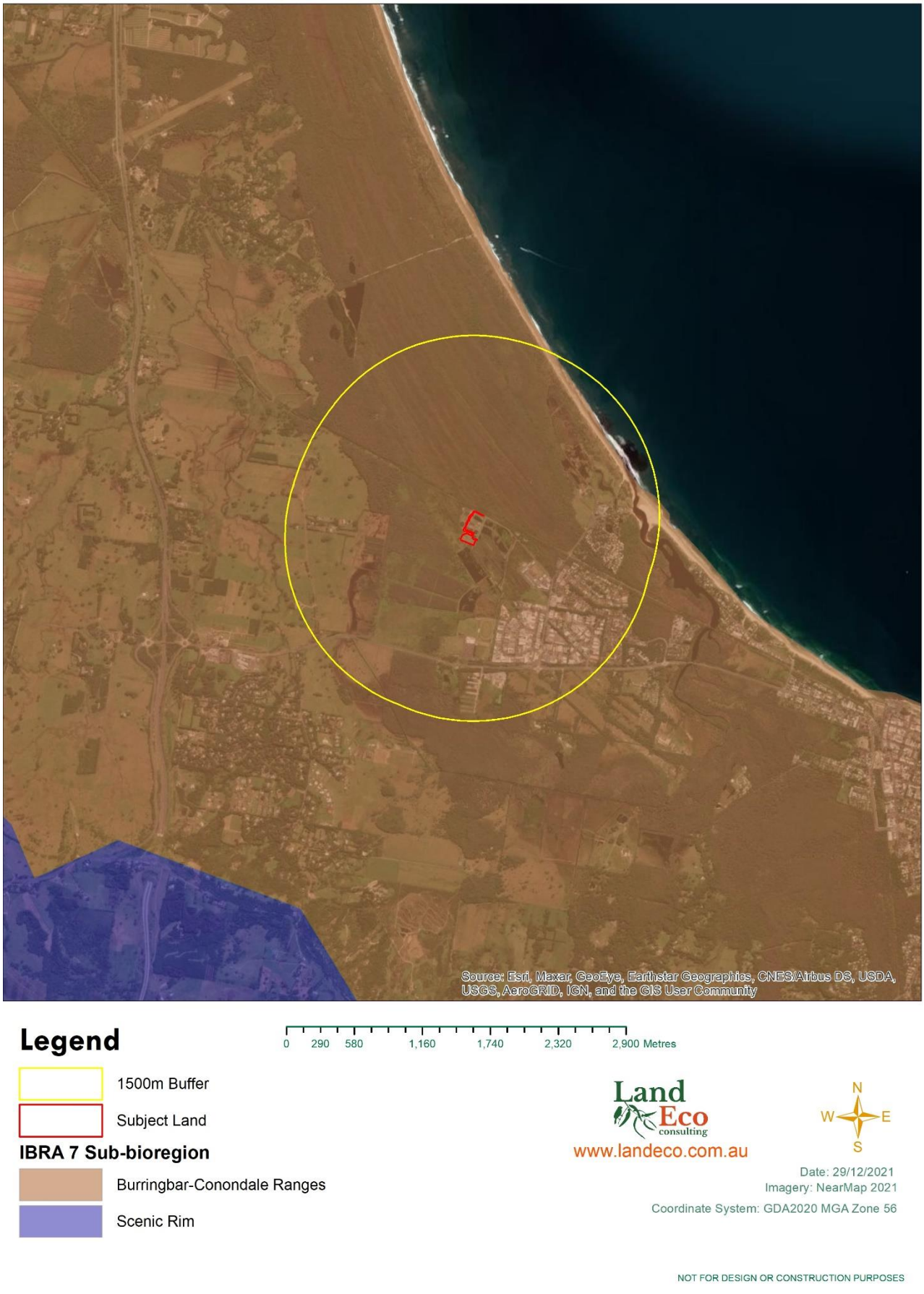

Figure 4. The assessment buffer surrounding the Subject Land lies entirely within the Burringbar-Conondale Ranges IBRA 7 Subregion of the South-east Queensland IBRA7 Bioregion.

Figure 5. The Mitchell Landscapes that comprise the Subject Land and the surrounding assessment area.

2.2.4 State Environmental Planning Policy (Coastal Management) 2018

The Subject Land is located within an area mapped 'proximity area for coastal wetland' (**Figure 6**) as defined under the *State Environmental Planning Policy (Coastal Management) 2018* which is one of the reasons for the designated development status of the proposal. The BEF has been designed in a manner that avoids impacts to the adjacent coastal wetlands.

The Coastal Wetlands and Littoral Rainforests Area Map (**Figure 6**) identifies certain land that is inside the coastal wetlands and littoral rainforests area as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" or both.

> (1) Development consent must not be granted to development on land identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on—
>
> > (a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or
> >
> > (b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.
>
> (2) This clause does not apply to land that is identified as "coastal wetlands" or "littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map.

The development is located within 'proximity area' for coastal wetlands, however, it has been confirmed that the development will not significantly impact upon the biophysical, hydrological or ecological integrity of the adjacent coastal wetland.

The proximity area that the development is built upon consists of derived grasslands, the majority of which is historically mowed.

A suite of impact mitigation measures to prevent impacts to the biophysical, hydrological and ecological integrity of the adjacent coastal wetland have been proposed (see **section 6**).

The proposed development does not separate a wetland proximity area from any area of mapped coastal wetland or littoral rainforest. Hydrological assessment and management plan (MPC 2021) will ensure the development does not impact upon the hydrology of the locality and will precent impacts upon the adjacent coastal wetlands.

Hydrological flows into the wetlands surrounding the development site are charged by the wetland ponds and dune swale systems located south-west of the development. It is not expected that the proposed development would effect hydrological systems (surface or sub-surface) in a manner that would impact upon nearby Coastal wetlands.

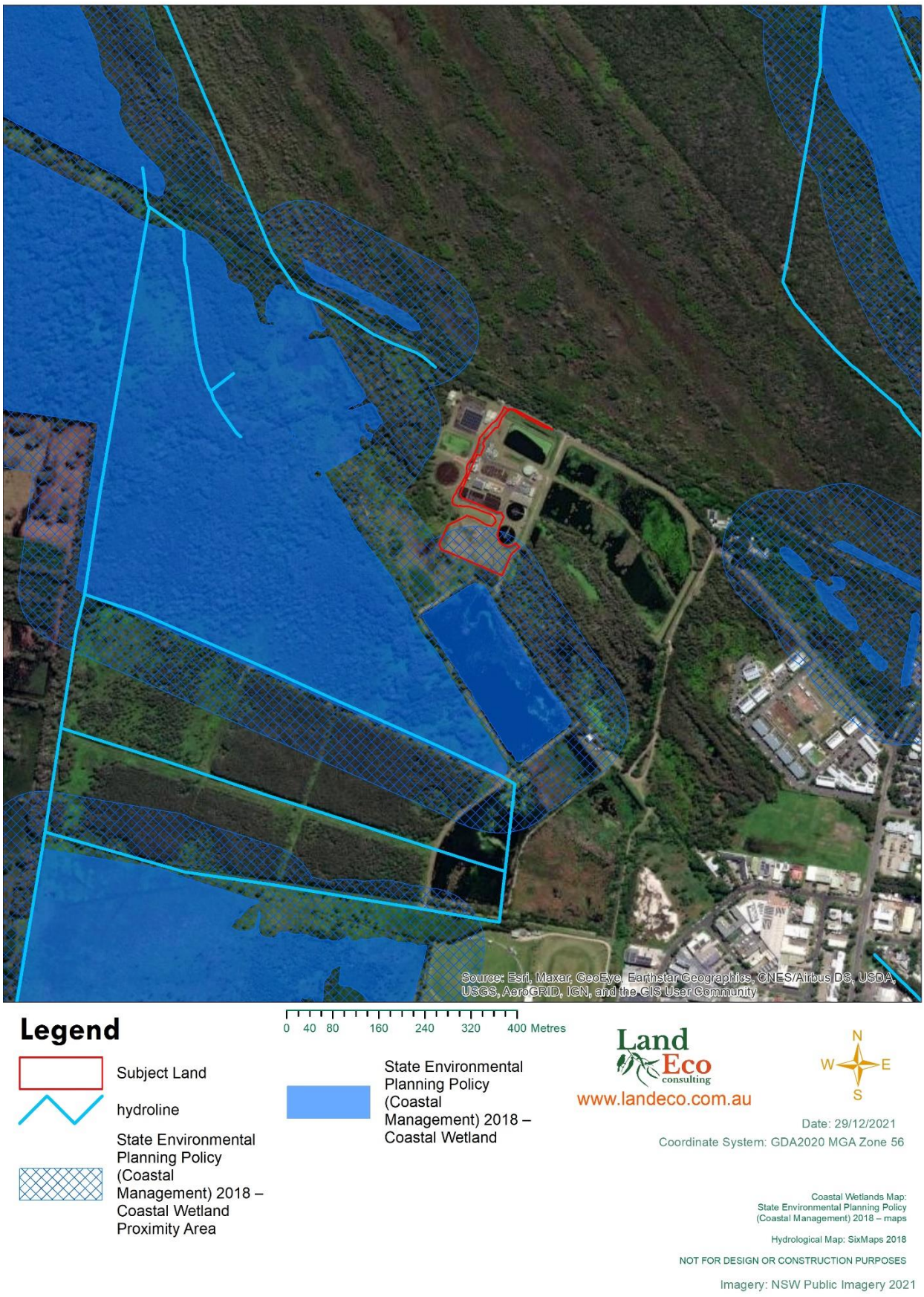

Figure 6. Wetlands, watercourses and waterbodies that occur within the 1500m assessment area surrounding the Subject Land

2.3 Habitat Connectivity

Significant biodiversity links are those that connect different areas of habitat, facilitating movement of threatened species across their distribution. The presence of significant biodiversity links on a site contributes to the biodiversity value of that subject land at the landscape scale. Connectivity can be identified at different scales depending on the target species and can include recognised biodiversity corridors in a plan approved by DPIE (e.g. priority investment areas), a local corridor identified by a local council, flyways for migratory species or a riparian buffer of a stream, wetland or estuary.

Land Eco has identified routes of habitat connectivity between the Subject Land and adjoining landscape and has classified them into four categories (**Figure 7**):

- Habitat connection – a local-scale habitat connection consisting of a narrow or disturbed vegetation corridor (i.e. canopy connectivity)
- Significant biodiversity link – a locally significant habitat connection consisting of remnant vegetation, reserves, densely vegetation riparian corridors or wetlands
- Wetland stepping stone connection – locally or regionally significant waterbodies or wetlands which are likely to be used as foraging, shelter or other 'stopovers' by nomadic or migratory wetland birds
- Riparian corridor – historically, mapped watercourses (present on a 1:25,000 topographic map).

Existing barriers to movement are mapped to show areas of land that have been historically cleared and developed such that they provide a hostile or 'sink' environment that is not conducive to effective or safe movement by fauna across the landscape. Only local and minor habitat links occur in these areas (**Figure 7**).

The entirety of the Subject Land is located in a historically cleared and developed STP compound that acts as a barrier to most safe and effective fauna movement. While there is minor fauna movement through the Subject Land (e.g. disturbance tolerant birds and frogs during moist conditions) there are no 'significant biodiversity links' or 'habitat links' in the Subject Land.

The nearest terrestrial habitat connectivity to the Subject Land lies immediately south and west of the Subject Land is comprised of Melaleuca swamp and Wallum swamp. These habitat connections connect south to the West Byron Biobanking Site, and a larger remnant patch of bushland, Tyagrah Nature Reserve and (**Figure 7**). These habitat connections will continue to exist, as they are, during and post development.

The proposed development is not likely to impact upon any fauna movement or corridors this is because:

1. The development is located in a cleared and historically developed site that is already a barrier to fauna movement
2. The finished structure will be similar in height and form to existing infrastructure associated with the existing, operational STP
3. Existing habitat corridors that surround the Subject Land will continue to exist, unhindered by the proposed development.

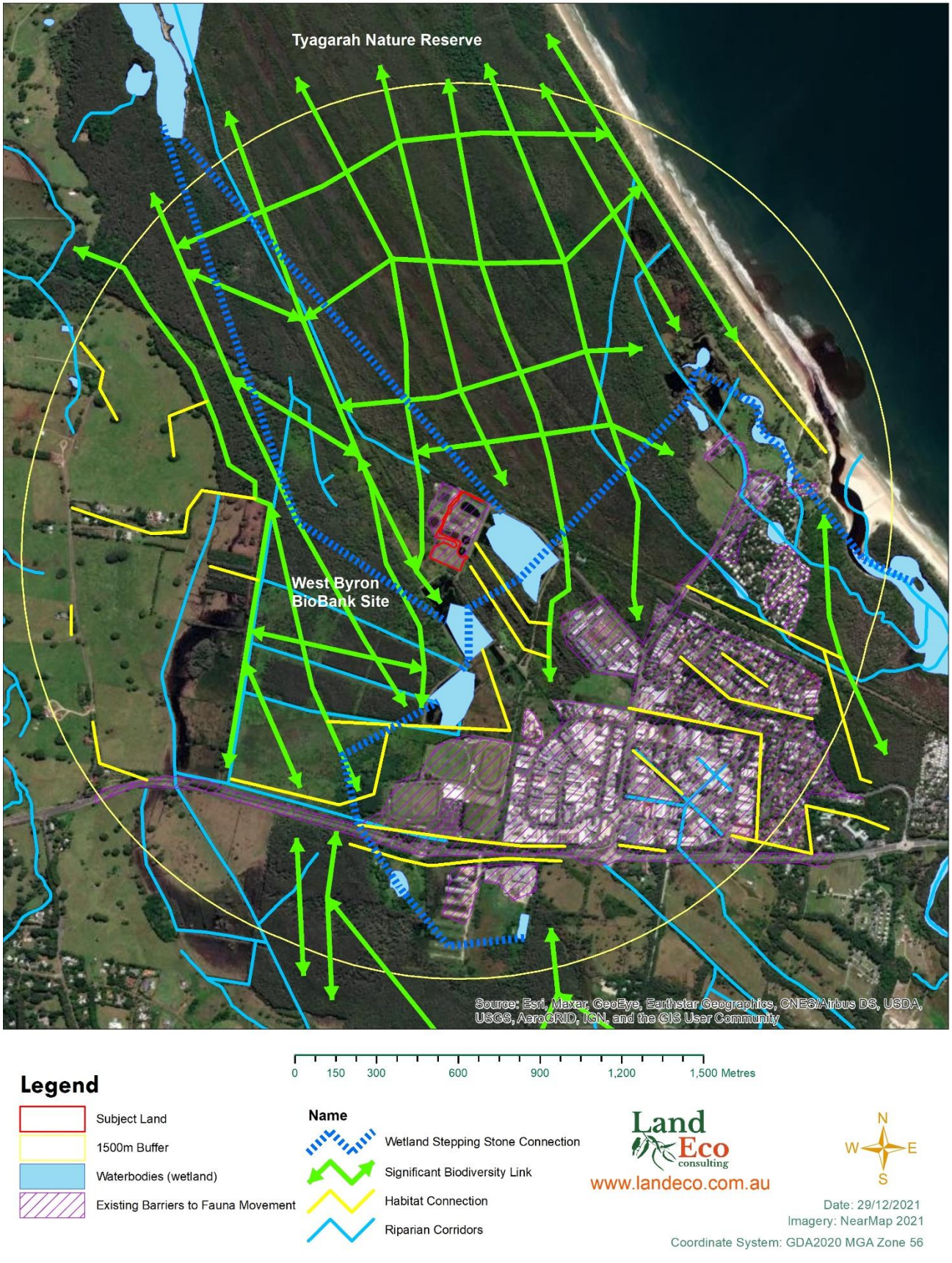

Figure 7. Habitat connectivity links within the Subject Land and surrounding area.

3. Native Vegetation

3.1 Assessing Patch Size

Patch size as defined by the BAM as an area of native vegetation that:

- occurs on the development site or biodiversity stewardship site, and
- includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).

Patch size may extend onto adjoining land that is not part of the development site (OEH 2017).

Patch size was calculated according to the above guidelines. It was confirmed that the native vegetation patch on the Subject Land connects with remnant vegetation to the south of the Subject Land.

There were extensive areas of historically 'vegetated land' located on private property that were not visited. In the absence of site data to show otherwise, these areas were assumed to be native dominant.

Land Eco confirmed a patch size of at least 500 hectares. The large patch size is because the native woodland vegetation in the Subject Land connects with the 'West Byron BioBank Site' and the Tyagarah Nature Reserve. The vegetation within the Subject Land has therefore been assessed under the >100ha patch size category (**Figure 8**).

3.2 Assessing Native Vegetation Cover

Native vegetation cover and patch size have been assessed in accordance with Section 3.2 of the Biodiversity Assessment Methodology (OEH 2020). Components of the site context have been used to assess the suitability of habitat for threatened species within the Subject Land.

A 1500m 'assessment circle' surrounding the outside edge of the boundary of the Subject Land was prepared to determine the extent of native vegetation within the surrounding locality of the Subject Land. Native vegetation was considered to cover approximately 573 ha of the total 823 ha area within the assessment circle, this is 69.6% which rounds up to 70% and places the site in the >30-70% vegetation cover class (**Figure 8**).

Legend

- Subject Land
- 1500m Buffer
- Native Vegetation Cover

0 150 300 600 900 1,200 1,500 Metres

N W E S

Land Eco consulting
www.landeco.com.au

Date: 29/12/2021
Imagery: © NSW EPI
Coordinate System: GDA2020 MGA Zone 56

NOT FOR DESIGN OR CONSTRUCTION PURPOSES

Figure 8. Native vegetation cover and patches within the area surrounding the Subject Land (1500m buffer).

3.3 Plant Community Types on the Subject Land

3.3.1 Historically Mapped Vegetation Communities

Broad vegetation communities have been mapped over the Subject Property during the following previous studies:

- Byron LGA Vegetation 2007 VIS_ID 6 (Ecograph and Terrafocus 2007).

This historical mapping is coarse and most of the polygons have not been ground-truth assessed by Ecologists. Vegetation has not been assigned to the level of Plant Community Type (PCT).

3.3.2 Confirmed Plant Community Types

Field survey and desktop analysis conducted by Land Eco confirmed one PCT within the Subject Property (**Figure 9**):

1. 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion

These PCT were further divided into zones described in **Table 6.**

Table 6. Vegetation Zones on the Subject Property

PCT	Vegetation Zone/ Condition Class	Area (ha) to be Cleared for Development (ha)	Description
No PCT	Exotic Dominant	0.36	Historically cleared and dominated by weeds. No native tree or shrub stratum. Canopy dominated by *Solanum mauritianum* (Tree Tobacco) and *Ricinus communis* (Castor Oil Plant).
1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Derived Native Grassland	0.52	Derived native grassland dominated by *Paspalum distichum* (Water Couch), *Cynodon dactylon* (Couch) and *Digitaria didactyla* (Queensland Blue Couch). Very low diversity of native forbs including *Centella asiatica* and *Wahlenbergia gracilis*.
	TOTAL	**0.88**	All of the vegetation mapped within the Subject Land will be permanently removed to facilitate the development. This vegetation is derived from historical clearing and has little ecological significance. All remnant forest and wetland vegetation surrounding the development will be retained and protected during and post development.

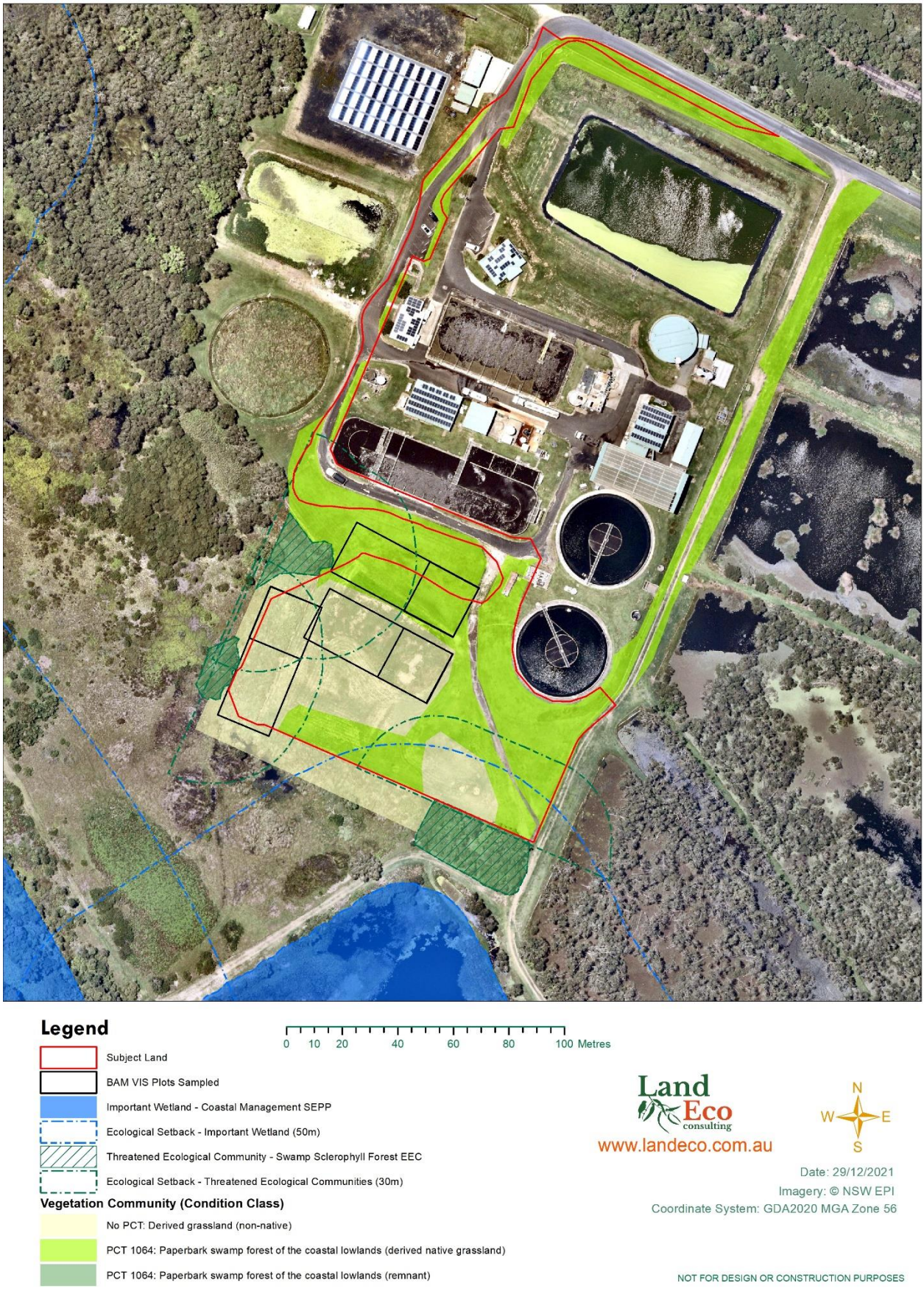

Figure 9. Native vegetation mapping and Byron Shire Ecological Setbacks within the Subject Land and BAM VIS Plots sampled within.

3.3.3 Selection Process for PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion

The selection criteria listed within **Table 7** were selected to develop the PCT shortlist. PCT selection was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2021c). Entering the criteria into the BioNet Vegetation Classification System tool revealed a shortlist of candidate PCT.

Table 7. Selection criteria for assignation of a PCT 1064 on the Subject Land

Selection Criteria	Criterion Entered into BioNet Vegetation Classification System (DPIE 2019c)	Comments
IBRA Bioregion	South Eastern Queensland	
IBRA Sub-bioregion	Burringbar-Conondale Ranges	
Characteristic Upper Stratum Species	Melaleuca quinqunervia Archontophoenix cunninghamiana	These trees were located in remnant patches outside of the Subject Land.
Landscape & Geology	Swamp land associated with podsolised dune swale	The proposed development is located within a modified landscape (STP).

This selection process delivered one candidate PCT:

1. 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion

3.3.4 Descriptions of the Plant Community Types located within the Subject Land

Field survey conducted by Land Eco confirmed that the PCT identified within the Subject Land consisted of one distinct condition class (**Table 8**).

Table 8. Floristic Summary of PCT 1064 within the Subject Land.

PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	
PCT Statistics	
Area Extant (ha): 4100 Pre-European Extent (ha): 8200 Estimated % remaining: 50% Area in conservation reserves (ha): PCT % cleared: 50% Keith Class: Coastal Swamp Forests	
Description in VIS	
None available.	
Description of the Vegetation on Subject Land	
Within the Subject Land this PCT occurred in an extremely species poor, derived state dominated by two native grasses. Tree, shrubs, ferns and vines were absent from the Subject Land. Outside of the Subject Land the patches of PCT 1064 where structurally complex and species diverse. These patches were dominated by Melaleuca quinquenervia, with associated *Archotopheonix cunninghamiana, Melicope elleryana* and *Macaranga tanarius* over *Parsonsia straminea, Marsdenia rostrata, Smilax australis, Acacia obtusifolia, Acacia melanoxylon, Acacia longifolia subsp. sophorae, Hibiscus diversidolius, Choricarpia leptopetala, Pittosporum multiflorum, Austromyrtus dulcis* with a dense fern and sedge layer dominated by *Gahnia clarkei, Blechnum indicum* and *Hypolepis muelleri.*	
Condition Classes	**Derived Grassland (Plate 1)**

PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	
Extent (ha) within Subject Land	0.50
Vegetation Integrity Score	2.4
Description of Condition Class on Subject Land	Historically cleared, derived grassland dominated by common native grasses. Extensive weed infestation.
Structure & Function of Vegetation in Subject Land	Native tree cover was 0%. The benchmark is 37%. Mature trees >50cm dbh were absent. Shrub layer was 0%. The benchmark is 12%. Native grass/sedge cover was 65% . The benchmark is 82%. Native forb cover was 0.3%. The benchmark was 2%. Litter was nearly absent with an average cover of 1.4% this is substantially lower than the benchmark of 42% Coarse woody debris was absent. The benchmark is 44m. Hight Threat Exotic weed cover was 30.5%
Survey Effort	One BAM VIS Plot (Plot 1)
TEC Status (Biodiversity Conservation Act 2016)	Does not meet the criteria to be classified as any TEC.

Plate 1. Representative photograph of the exotic dominated vegetation (no PCT) within the Subject Land

Plate 2. Representative photograph of PCT 1064 (derived native grassland) within the Subject Land

3.4 Threatened Ecological Communities

The PCT 1064 is often associated with '*Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*' endangered ecological community (EEC) (NSW Scientific Committee 2011). This EEC does not occur in a 'derived grassland' form, therefore the extent that occurs in the Subject Land does not qualify to be assessed as this EEC. Patches of remnant PCT 1064 located near the Subject Land are dominated by *Melaleuca quinquenervia* with a diverse vine, shrub, fern and sedge layer. The proposed development is not expected to impact upon this EEC.

The Subject Property contains some natural wetland areas that may meet the criteria of the final determination for '*Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*' EEC (NSW Threatened Species Scientific Committee 2011a) however, the settling ponds and artificial waterbodies produced for the STP do not qualify as this EEC. The Final Determination specifically states "*Artificial wetlands created on previously dry land specifically for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community*." (NSW Threatened Species Scientific Committee 2011a).

3.5 Vegetation Integrity Survey Plots

A total of three BAM Vegetation Integrity Survey (VIS) Plots were sampled within the Subject Land (**Figure 9**). Each plot was measured out to 50m x 20m. Plot data gathered for each attribute used to assess the function of the Subject Land vegetation is detailed in **Appendix B.** Vegetation Integrity Survey Scores, represented by existing vegetation within each vegetation zone, are detailed in **Table 9.** The future VIS Scores post development have been assigned to zero. This equates to total clearing.

In accordance with the BAM (DPIE 2020) if during the assessment of biodiversity values for any type of development, clearing or biodiversity certification proposal as required by section 9.2.1.1 of the BAM, the assessor determines that:

> (a) an area of land does not contain native vegetation (or the vegetation consists entirely of groundcover with >50% groundcover foliage representative of non-native species), or
>
> (b) a vegetation zone has a vegetation integrity score of 15 or lower where the PCT is representative of an EEC or critically endangered ecological community (CEEC), or
>
> (c) a vegetation zone has a vegetation integrity score of 17 or lower where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community (VEC), or
>
> (d) a vegetation zone has a vegetation integrity score of 20 or lower where the PCT is not representative of a TEC or associated with threatened species habitat.

An offset is not needed for impacts on native vegetation if the vegetation integrity score is below those listed in Subsection 9.2.1.1.; however, if the entity is at risk of an SAII the assessor will need to address the relevant criteria in Section 9.1 and include this in the BDAR.

Table 9. Vegetation Integrity Survey scores for each vegetation zone.

Plant Community Type	Vegetation Zone	Area (ha) in BAM Calculator	Survey Effort	Composition Condition Score	Structure Condition Score	Hollow Bearing Trees	Function Condition Score	Current VIS	Future VIS
1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Moderate Weed Infestation Part Cleared		One (1) BAM VIS Plot • Plot No 2	15.2	56.2	0	0	2.4	0
None	Severe Weed Infestation		Two (2) BAM VIS Plot • Plot No.3 • Plot No.4 Each plot revealed >50% non-native groundcover and 0% shrubs or trees. As a result, this vegetation was not native, and the BAM VIS data was not entered into the BAMC.	NA	NA	NA	NA	NA	NA

4. Threatened Species

In accordance with section 9.2.2 of the BAM (DPIE 2020):

- The assessor must determine an offset for the impacts of proposals on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥17. If the vegetation integrity score is 17 or below then ecosystem credits do not require further assessment in the BDAR.

- The assessor must determine an offset for the impacts of proposals on threatened species that require species credits, identified in accordance with Chapter 5 of the BAM.

- The method for determining offset requirements for impacts on threatened species and threatened species habitat is described in Chapter 10 of the BAM.

In accordance with section 9.3 of the BAM:

1. Areas within the subject land that do not contain native vegetation do not need to be assessed for ecosystem credits., however,

2. Areas of land that do not contain native vegetation must still be assessed for threatened species habitat in accordance with Chapter 5 of the BAM and prescribed biodiversity impacts in accordance with Chapter 6 of the BAM.

4.1 Habitat Features for Species and Ecosystem Credit Fauna Species

The Land Eco Consulting Ecologists compiled a detailed summary of potential habitat for threatened fauna species, including both Species Credit and Ecosystem Credit threatened fauna species (**Table 10**). All opportunistic species observed by Land Eco Consulting are presented (**Appendix A**).

Table 10. Fauna Habitat Values on the Subject Land

Habitat component	Site values
Hollow-bearing trees, including dead stags	Absent. There are no hollow-bearing trees located in or near the proposed development.
Large trees with basal cavities	Absent.
Rock outcrops and bush rock	Absent.
Caves, crevices and overhangs	Absent.
Natural burrows	Absent.
Coarse woody debris (logs)	Absent.
Wetlands, soaks and streams	Artificial wetlands constructed as settling ponds for the STP surround the Subject Land. Areas of pooled water occur in the grassy areas after rainfall. Natural wetlands exist approximately 50 metres west and south of the Subject Land.
Open water bodies	Open waterbodies constructed as settling ponds for the STP surround the Subject Land.
Nests and roosts	No large stick nests suitable for threatened raptorial birds of prey were observed on or near the Subject Land during the assessment. No dense canopy of a type suitable for roosts were found.
Sap and gum sources (feed trees for gliders)	Absent.
Distinctive scats or latrine sites	Absent.

Habitat component	Site values
She-oak fruit (Glossy Black Cockatoo feed)	Absent.
Culverts, bridges, mine shafts, or abandoned structures (microbat subterranean roosts)	Absent.
Decorticating bark or palm fronds suitable for micobat roosts	Absent.
Flying-fox camps	Absent.
Nectar-bearing trees (e.g. winter-flowering)	Absent. There are no nectar-bearing trees or shrubs located in the Subject Land.
Lerp-bearing trees	Absent. There are no lerp-bearing trees or shrubs located in the Subject Land.
Nectar-bearing shrubs	Absent. There are no nectar-bearing trees or shrubs located in the Subject Land.
Mistletoes	Absent.
Koala browse trees	Absent. There are no native trees located in the Subject Land.
Seed-bearing trees and shrubs	Absent.
Soft-fruit-bearing trees or shrubs	The introduced Tree Tobacco is the only fruit-bearing tree that occurs in the Subject Land. This is a weed and must be removed.
Dense shrubbery and leaf litter	Absent.
Dense grassland	The *Setaria sphacelata* dominated grassland was dense and provided habitat for fauna including a diverse suite of birds, *Litoria fallax* (Dwarf Sedge Frog), *Wallabia bicolor* (Swamp Wallaby) and Mitchell's Rainforest Snail.
Estuarine, beach, mudflats, and rocky foreshores	Absent.

4.2 Candidate Ecosystem Credit Species

Ecosystem credit species associated with the Subject Land are listed below in **Table 11** Ecosystem Credits would be calculated for any native vegetation zones that have a VIS score greater than (see **Table 9**).

Table 11. Ecosystem Credit Threatened Fauna Predicted to Occur in the Subject Property

Scientific Name	BC Act Status	Included in Assessment	Survey Effort Undertaken	Reason for Inclusion/Exclusion from Assessment
Amaurornis moluccana Pale-vented Bush-hen	Vulnerable	✔	6 nights spotlighting and call playback. 9 days of diurnal survey. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands outside of the Subject Land. Historical records occur in adjacent lands including nearby BioBanking Site. Most recent record was of 1 bird on 20/02/21 (eBird 2021). Suitable dense vegetation, within 300m of, or in shallows of streams or other natural or artificial wetlands. Byron Bird Buddies (2021) reports few sightings of this species, with only two surveys detecting the bird in recent times, both times up to two bird heard calling in December 2020. The species is known from the BioBank site within the STP property.
Anseranas semipalmata Magpie Goose	Vulnerable	✔	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands outside of the Subject Land. Byron Bird Buddies (2021) reported a sighting of this species within the Byron Bay STP property in March 2011. No sightings have been recorded since.
Anthochaera phrygia Regent Honeyeater (Foraging)	Critically Endangered	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	No mapped habitat. No feed trees in the Subject Land. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Artamus cyanopterus cyanopterus Dusky Woodswallow	Vulnerable	✔	9 days of diurnal survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species may occur in the area as a vagrant. Individuals may perch on the compound fence and forage on the grass.
Botaurus poiciloptilus Australasian Bittern	Endangered	✔	6 nights spotlighting and call playback. 9 days of diurnal survey. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands outside of the Subject Land. Most recent record was of one bird flushed from reeds opposite the visitor centre on 12/09/2020 (eBird 2021). There is no suitable brackish or freshwater wetlands in the Subject Land (e.g. reed habitat) however, individuals may shelter in the dense *Setaria sphacelata* growth or hunt for frogs in the open grass areas during wet conditions on occasion. Byron Bird Buddies (2021) reported a single bird seen on four in 2019 and once in 2020 from D-cell and H-cell.

Scientific Name	BC Act Status	Included in Assessment	Survey Effort Undertaken	Reason for Inclusion/Exclusion from Assessment
Calidris ferruginea Curlew Sandpiper (Foraging)	Endangered	X	9 days of bird survey between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands outside of the Subject Land. Byron Bird Buddies (2021) detail a record made by David Stewart from 2002. Most recent record was of one bird on 23/02/2019 (eBird 2021). This species may forage or shelter on the mudflats in the artificial wetland east of the proposed access road. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Calidris tenuirostris Great Knot (Foraging)	Vulnerable	X	9 days of bird survey. No individuals detected.	This species only forages on intertidal areas and estuarine mudflats. No suitable habitat occurs in the Subject Land or immediate surrounds. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	Vulnerable	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands outside of the Subject Land. Most recent record was of two birds on 18/07/2020 (eBird 2021). No suitable forage trees in the Subject Land or immediate surrounds. Byron Bird Buddies (2021) report that the Glossy Black Cockatoo is rarely recorded from the Byron Bay STP. Three birds were recorded in the STP property in November 2019. The Bird Buddies report that there are few suitable *Allocasuarina spp.* trees present in the STP property to promote regular foraging of this species. A small family group may roost beyond the northern fence of the Byron Bay STP property. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Charadrius mongolus Lesser Sand Plover	Vulnerable	X	9 days of bird survey. No individuals detected.	This species usually only forages on intertidal areas and estuarine mudflats. No suitable habitat occurs in the Subject Land or immediate surrounds. Byron Bird Buddies (2021) reports that the first record of this species from the STP property was in December 2019 when a single bird was reported. In August to December 2019, due to an extended dry period, H cell was drying out with extensive areas of moist mud flats. Between December 24th and 26th more water was added to the cell, resulting in fewer mudflats and the bird disappeared. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Charadrius leschenaultii Greater Sand Plover	Vulnerable	X	9 days of bird survey. No individuals detected.	This species usually only forages on intertidal areas and estuarine mudflats. No suitable habitat occurs in the Subject Land or immediate surrounds. An individual was recorded in the Subject Property in November 2009 by Steve McBride (Byron Bird Buddies 2021) It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Chalinolobus nigrogriseus Hoary Wattled Bat	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.

Scientific Name	BC Act Status	Included in Assessment	Survey Effort Undertaken	Reason for Inclusion/Exclusion from Assessment
Circus assimilis Spotted Harrier	Vulnerable	✔	9 days of bird survey. No individuals detected.	This species is a vagrant to the area however, it may still forage for prey in the Subject Land during drier conditions inland. Vagrant only.
Coracina lineata Barred Cuckoo-shrike	Vulnerable	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is likely to forage and nest in fruiting trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage/nest in. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Daphoenositta chrysoptera Varied Sittella	Vulnerable	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is likely to forage and nest in trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage/nest in. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	✔	6 nights spotlighting. 15 nights x 5 infra-red cameras deployed around the Subject Land. Each camera was baited with honey/sardines/truffle oil. No individuals detected.	This species may pass through the Subject Land on occasion. It is known to occur in nearby Tyagarah Nature Reserve.
Ephippiorhynchus asiaticus Black-necked Stork	Endangered	✔	9 days of bird survey between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands. There are no suitable nesting sites (tall trees) and no suitable brackish or freshwater wetlands in the Subject Land, however, individuals may hunt for frogs in the open grass areas during wet conditions. Byron Bird Buddies (2021) reported two adult birds in H-cell in the Byron Bay STP wetlands on several occasions during 2015-2016, a juvenile bird was recorded on Nov 2019, on other occasions it has usually been a lone adult. The birds do not stay on site for very long and are easily disturbed. The movement of this species is nomadic and they disperse after breeding.
Esacus magnirostris Beach Stone-curlew (Foraging)	Critically Endangered	X	9 days of bird survey. No individuals detected.	This species only occurs in tidal areas such as shorelines and estuaries. It requires sandy beaches, rock platforms, saltmarsh, mangrove or estuarine mudflats all of which were absent from the Subject Land. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Falsistrellus tasmaniensis Eastern False Pipistrelle	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.
Glossopsitta pusilla Little Lorikeet	Vulnerable	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is likely to forage in trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage in. It is not likely to utilise the exotic grass or mown grass in the Subject Land.

Scientific Name	BC Act Status	Included in Assessment	Survey Effort Undertaken	Reason for Inclusion/Exclusion from Assessment
Grus rubicunda Brolga	Vulnerable	✔	9 days of diurnal survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands outside of the Subject Land. The most recent record was of 1 bird on 12/06/2020 (eBird 2021). There are no suitable nesting sites and no suitable brackish or freshwater wetlands in the Subject Land however, individuals may hunt for frogs in the open grass areas during wet conditions. Byron Bird Buddies (2021) reported a single sighting of a bird flying overhead in June 2020. Prior to that, a single bird was observed foraging in the Byron STP in October 2009 (Byron Bird Buddies 2010).
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	Vulnerable	✔	9 days of diurnal survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. One mature individual observed hunting above the Subject Land.	This species was observed flying over the Subject Land hunting waterbirds in the adjacent wetland. Suitable foraging habitat occurs in the Subject Land.
Hieraaetus morphnoides Little Eagle (Foraging)	Vulnerable	✔	9 days of diurnal survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. One mature individual observed hunting above the Subject Land.	This species is rare in the Byron Bay area however, it may forage for prey within the Subject Land on occasion. The Byron Bay Bird Buddies (2021) have reported single birds in June 2014, May 2016 and June 2018. Both times the birds have been flying overhead. This bird is a rare visitor to the Byron Shire.
Irediparra gallinacea Comb-crested Jacana)	Vulnerable	X	9 days of diurnal survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is known from the Byron Bay STP wetlands outside of the Subject Land. Byron Bay STP is an important site for this species. Land Eco Ecologist observed three mature birds on the southern end of Cell-H and Cell-I opposite the education centre. Byron Bird Buddies (2021) reported Numbers ranged from 0 to 18 per visit with the greatest number recorded 18/11/20. It is not likely to utilise habitat within the Subject Land but known to use the artificial wetlands immediately adjacent. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Ixobrychus flavicollis Black Bittern	Vulnerable	✔	9 days of diurnal survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	Suitable roosting habitat exists adjacent the Subject Land. There is no suitable brackish or freshwater wetlands in the Subject Land (e.g. reed habitat) however, individuals may shelter in the dense *Setaria sphacelata* growth or hunt for frogs in the open grass areas during wet conditions on occasion. Byron Bird Buddies (2021) made their third ever record of this species from the Byron STP in June 2016. A single bird was seen at the back of H cell. A previous sighting was made in June 2011.

Scientific Name	BC Act Status	Included in Assessment	Survey Effort Undertaken	Reason for Inclusion/Exclusion from Assessment
Lathamus discolor Swift Parrot (Foraging)	Endangered	X	None	There are no recent proximal records of Swift Parrot (eBird 2021). However, the Subject Land is mapped on the DPIE 'Important Habitat Map'. The Subject Land contains no feed trees considered suitable for foraging by Swift Parrot. THe Swift Parrot only nests in Tasmania. It migrates to NSW to forage in autumn-winter.
Limicola falcinellus Broad-billed Sandpiper (Foraging)	Vulnerable	X	9 days of bird survey between February and March 2021. No individuals detected.	There are no recent proximal records of Broad-billed Sandpiper. It is a vagrant to NSW. Habitat requirements are the same as Curlew Sandpiper. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Lophoictinia isura Square-tailed Kite (Foraging)	Vulnerable	✔	9 days of bird survey between February and March 2021. No individuals detected.	The Square-tailed Kite is rare in coastal northern NSW. There are few records. There are no recent records from Byron Bay STP. It may hunt over the Subject Land on rare occasions. Byron Bird Buddies (2021) detail a sighting from M. Fitzgerald however no date was supplied.
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.
Miniopterus australis Little Bent-winged bat (Foraging)	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion.
Miniopterus orianae oceanensis Large Bent-winged bat (Foraging)	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion.
Ninox connivens Barking Owl (Foraging)	Vulnerable	✔	6 nights spotlighting and call playback. 9 days of diurnal survey looking for roosts around the Subject Land. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	May hunt for prey (birds or small mammals) within the Subject Land on occasion.
Ninox strenua Powerful Owl (Foraging)	Vulnerable	✔	6 nights spotlighting and call playback. 9 days of diurnal survey looking for roosts around the Subject Land. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	May hunt for prey (birds or small mammals) within the Subject Land on occasion.
Nyctophilus bifax Eastern Long-eared Bat	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.
Ozimops lumsdenae Northern Free-tailed Bat	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.
Pandion cristatus Eastern Osprey (Foraging)	Vulnerable	X	9 days of bird survey. No individuals detected.	The Subject Land contains no open water bodies suitable for foraging for fish prey. No trees for perching/roosting within the Subject Land. Byron Bird Buddies (2021) have reported four sightings of single birds passing over the Byron Bay STP property. THe

Scientific Name	BC Act Status	Included in Assessment	Survey Effort Undertaken	Reason for Inclusion/Exclusion from Assessment
				sightings were in October 2014, September 2016, August 2017 and November 2020.
Petaurus australis Yellow-bellied Glider	Vulnerable	X	None	No suitable trees for foraging and no hollows for shelter/breeding within the Subject Land.
Phascolarctos cinereus Koala (Foraging)	Vulnerable	X	6 nights of spotlighting. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	No suitable trees for foraging within the Subject Land.
Phoniscus papuensis Golden-tipped Bat	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.
Pseudomys gracilicaudatus Eastern Chestnut Mouse	Vulnerable	✔	15 nights x 5 infra-red cameras deployed around the Subject Land. Each camera was baited with honey/sardines/truffle oil. No individuals detected.	This species may pass through the Subject Land on occasion between patches of dense Wallum Heath.
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	Vulnerable	X	6 nights of spotlighting. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is likely to forage in fruiting or flowering trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage in.
Ptilinopus magnificus Wompoo Fruit-dove	Vulnerable	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is likely to forage and nest in fruiting trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage/nest in. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Ptilinopus regina Rose-crowned Fruit-Dove	Vulnerable	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is likely to forage and nest in fruiting trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage/nest in. Byron Bird Buddies (2021) reported individuals calling in May and June 2017 and in May 2019. The species is not commonly observed, and where it does it is usually recorded west of H-cell from the vicinity of the BioBank site. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Ptilinopus superbus Superb Fruit-Dove	Vulnerable	X	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species is likely to forage and nest in fruiting trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage/nest in. It is not likely to utilise the exotic grass or mown grass in the Subject Land.
Rostratula australis Australian Painted Snipe	Endangered	✔	9 days of bird survey. No individuals detected.	No recent records of this rare vagrant. Byron Bird Buddies (2021) describe a record from 12/01/2021.

Scientific Name	BC Act Status	Included in Assessment	Survey Effort Undertaken	Reason for Inclusion/Exclusion from Assessment
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.
Scoteanax rueppellii Greater Broad-nosed Bat	Vulnerable	✔	15 nights of passive ultrasonic microbat survey (SongMeter)	May forage over the Subject Land on occasion. Not likely to breed or roost in the Subject Land as there are no suitable trees.
Stagonopleura guttata Diamond Firetail	Vulnerable	X	9 days of diurnal survey	This species would only occur in the area as vagrant. No suitable nest habitat in the Subject Land. Requires native grasses for foraging. It requires dense canopy, mistletoe, coarse woody debris or hollow-bearing trees for nesting all are absent from the Subject Land.
Sternula albifrons Little Tern (Foraging)	Endangered	X	9 days of diurnal survey	This species is known from the Byron Bay STP wetlands outside of the Subject Land. The most recent record was of a single bird in 20/01/2006 (eBird 2021). May fly over the Subject Land on occasion. Not likely to forage within the Subject Land as there is no open water and fish prey. X
Stictonetta naevosa Freckled Duck	Vulnerable	✔	9 days of diurnal survey	This species is known from the Byron Bay STP wetlands outside of the Subject Land. The most recent record in eBird (2021) was of 2 birds in on 24/12/2019. Byron Bird Buddies (2021) note that in 2019, 14-18 birds were recorded in H and I cell in the Byron Bay STP wetlands over the months of March- April.
Syconycteris australis Common Blossom-bat	Vulnerable	X	6 nights spotlighting.	This species is likely to forage in fruiting or flowering trees located immediately outside of the Subject Land, however, it will not forage within the Subject Land as there are no trees to forage in.
Tyto longimembris Eastern Grass Owl	Vulnerable	✔	6 nights spotlighting and call playback. 9 days of diurnal survey looking for roosts in around the Subject Land. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	May hunt for prey (birds or small mammals) within the Subject Land on occasion. May shelter in the dense *Setaria sphacelata* within the Subject Land. There are no recent proximal records of this species (eBird 2021). Byron Bird Buddies (2021) detail a sighting made on 12/02/2002 by David Stewart.
Tyto novaehollandiae Masked Owl (Foraging)	Vulnerable	✔	6 nights spotlighting and call playback. 9 days of diurnal survey looking for roosts in around the Subject Land. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	May hunt for prey (birds or small mammals) within the Subject Land on occasion.
Tyto tenebricosa Sooty Owl (Foraging)	Vulnerable	✔	6 nights spotlighting and call playback. 9 days of diurnal survey looking for roosts around the Subject Land. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	May hunt for prey (birds or small mammals) within the Subject Land on occasion.
Xenus cinereus Terek Sandpiper (Foraging)	Vulnerable	X	9 days of bird survey. No individuals detected.	This species only forages on intertidal areas and estuarine mudflats. No suitable habitat occurs in the Subject Land or immediate surrounds. It is not likely to utilise the exotic grass or mown grass in the Subject Land.

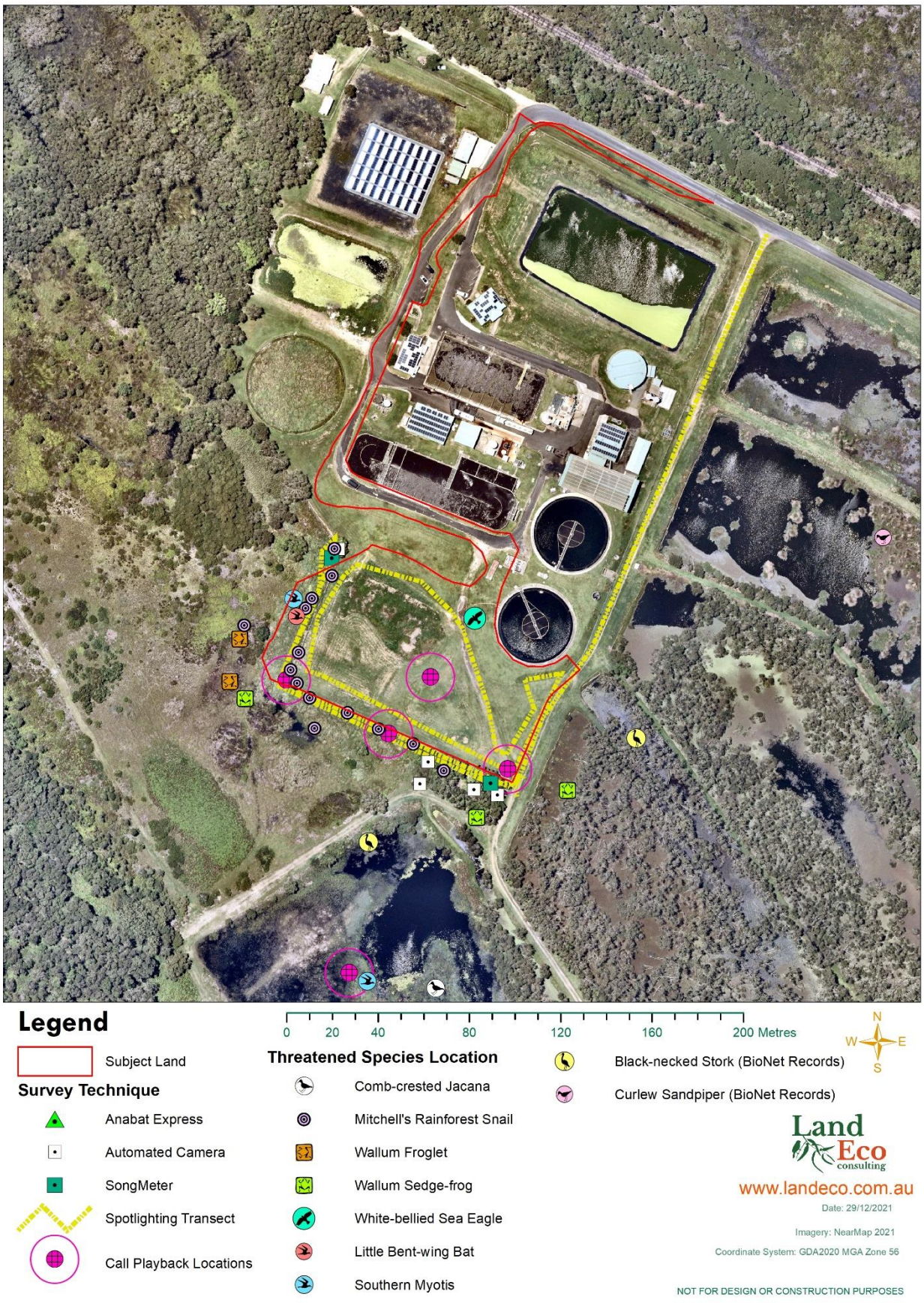

Figure 10. Fauna Survey Techniques Employed by Land Eco during the Survey Period and Locations of Threatened Species.

4.3 Candidate Species Credit Fauna Species

This BDAR was prepared in accordance with Appendix C of the BAM (DPIE 2020). Targeted surveys were carried-out across the Subject Property for all potentially occurring threatened 'species credit' fauna species that are listed 'Serious and Irreversible Impact' (SAII) under the BC Act.

The suite of methods utilised is presented (**Figure 10**) and detailed (**Table 12**).

Appropriate survey timing for each targeted species is presented (**Table 13**).

Several 'Species Credit' species were recorded in the Subject Land, however, there is no obligation to retire credits to offset these species because Council opted into the BOS, and there is no mechanism to facilitate retiring of biodiversity offset credits when Councils choose to opt into the BOS (**Appendix F**).

Table 12. Species Credit Threatened Fauna Predicted to Occur in the Subject Land and Survey Effort Undertaken by Land Eco

Species	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Survey Effort	Suitable Habitat Present within/around the Subject Land? (DPIE 2021c)	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Anthochaera phrygia Regent Honeyeater (Breeding)	Critically Endangered	No	No	NA	The Subject Land is not included in the DPIE 'map of important habitat' for Regent Honeyeater.	Unlikely. The Subject Land is not included in the DPIE 'map of important habitat'.	Very High - 3	No
Argynnis hyperbius Laced Fritillary	Endangered	No	No	NA	The habitat constraint for this species is 'Arrowhead Violet (*Viola betonicifolia*)' and the geographic constraint is 15km of coast. While the Subject Land is within 15km of coast, targeted surveys revealed no *Viola betonicifolia* within or adjacent to the Subject Land.	Unlikely. The Subject Land does not contain any known feed plants.	Very High - 3	No
Burhinus grallarius Bush Stone-curlew	Endangered	No	Yes	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. May inhabit urban areas. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	Unlikely. No sightings in Subject Land despite targeted survey effort. No fallen timber.	High - 2	No
Calidris ferruginea Curlew Sandpiper (Breeding)	Endangered	No	Yes	9 days of bird survey between February and March 2021. No individuals detected.	BioNet states: "*Migratory species, key threats occurring overseas. Note that it does not breed in NSW or elsewhere in Australia but relies on successful feeding here to migrate >10,000km back to its breeding grounds.* *The species is a dual credit species, with the species credit component mapped as an important area. These mapped areas do NOT require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts. Note that whilst this is a partnership species in NSW it is listed nationally and therefore retained as a potential SAII species.*" This species is known from the Byron Bay STP wetlands outside of the Subject Land. Most recent record was of one bird on 23/02/2019 (eBird 2021). This species may forage or shelter on the mudflats in the artificial wetland east of the proposed access road. No potential habitat will be cleared for the proposed development.	Unlikely. The Subject Land is not included in the DPIE 'map of important habitat'.	Very High - 3	No

Species	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Survey Effort	Suitable Habitat Present within/around the Subject Land? (DPIE 2021c)	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Calidris tenuirostris Great Knot (Breeding)	Vulnerable	No	No	NA	This species only forages on intertidal areas and estuarine mudflats. No suitable habitat occurs in the Subject Land or surrounds.	Unlikely. No suitable foraging habitat. The Subject Land is not included in the DPIE 'map of important habitat'.	Very High - 3	No
Carterornis leucotis White-eared Monarch	Vulnerable	Yes	Yes	9 days of bird survey. 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	In NSW, White-eared Monarchs occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest. They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads. They are highly active when foraging, characteristically sallying, hovering and fluttering around the outer foliage of rainforest trees. They are usually observed high in the canopy or subcanopy. They eat insects, but their diet is not well studied. They breed from about September to March, usually nesting high in the canopy, and often at the edge of patches of rainforest. Byron Bird Buddies (2021) reported the first record of this species from the Byron STP property in June 2020 when two birds were seen by A. Stanton. The birds were observed in the forested area at the SW corner of H-cell. It is not likely that this species breeds at this location, with individuals likely to be stopping over as they pass through between more significant habitat outside of the Byron STP.	Unlikely. No suitable habitat in Subject Land.	High - 2	No
Chalinolobus dwyeri Large-eared Pied Bat	Vulnerable	No	No	Microchiropteran bats were surveyed via recording and analysis of their echolocation calls. Calls were recorded from dusk to dawn using an Anabat Express bat detector. This detector was placed in a stationary position on site from the 16th of February to 8th March 2021, totalling 200 survey	The Subject Land does not occur within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices. This is the 'Habitat constraint' to include Large-eared Pied Bat in an assessment. There is no suitable cavernous rock potential breeding habitat in the Subject Land, only foraging habitat (native tree canopy and open areas).	Unlikely. No suitable habitat in Subject Land.	Very High - 3	No

Species	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Survey Effort	Suitable Habitat Present within/around the Subject Land? (DPIE 2021c)	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
				hours.				
Haematopus longirostris Australian Pied Oystercatcher	Endangered	No	No	NA	The Subject Land contains no habitat suitable for this species. It forages in intertidal areas and breeds on foredunes. Both habitats are absent from the Subject Land. Byron Bird Buddies (2021) have reported a sighting from October 2017 of a single bird flying overhead.	Unlikely. No suitable habitat in Subject Land.	High - 2	No
Planigale maculata Common Planigale	Vulnerable	Yes	Yes	Recent proximal records in BioNet from the Subject Property. This species credit is assumed present.	Recent proximal records in BioNet from the Subject Property. This species credit is assumed present.	Potential. Confirmed present in the Subject Property.	High - 2	No
Lathamus discolor Swift Parrot (Breeding)	Endangered	No	No	NA	The Subject Land is not included in the DPIE 'map of important habitat'.	The Subject Land is not included in the DPIE 'map of important habitat'.	Very High - 3	No
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot	Critically Endangered	No	Yes	9 days of bird survey between February and March 2021. No individuals detected.	There are no trees located within the Subject Land, let alone fruit-bearing trees of a species favoured by Coxen's Fig Parrot. This species is extremely rare in NSW with very few records from the last 30 years, some people presume it to be extinct in NSW.	Unlikely. No suitable habitat in Subject Land.	Very High - 3	No
Erythrotriorchis radiatus Red Goshawk	Critically Endangered	Yes	Yes	9 days of bird survey between February and March 2021. No individuals detected.	There is no suitable nesting or perching tree habitat within the Subject Land, however, Red Goshawk could hunt for prey (birds) over the Subject Land. This species is extremely rare in NSW with very few records from the last 30 years, some people presume it to be extinct in NSW.	Unlikely. No suitable habitat in Subject Land.	Very High - 3	No
Esacus magnirostris Beach Stone-curlew (Breeding)	Critically Endangered	No	Yes	NA	This species only occurs in tidal areas such as shorelines and estuaries. It requires sandy beaches, rock platforms, saltmarsh, mangrove or estuarine mudflats all of which were absent from the Subject Land.	Unlikely. No suitable foraging or breeding habitat. The Subject Land is not included in the DPIE 'map of important habitat'.	Very High - 3	No
Miniopterus australis Little Bent-winged Bat (Breeding)	Vulnerable	No	No	NA	The 'habitat constraint' for this species is 'Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' or observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature' This species breeds in caves, tunnels, mine shafts, culverts and outcrops. None of which occur in or near the Subject Land.	Unlikely. No suitable habitat in Subject Land.	Very High - 3	No

Species	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Survey Effort	Suitable Habitat Present within/around the Subject Land? (DPIE 2021c)	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Miniopterus orianae oceanensis Large Bent-winged Bat (Breeding)	Vulnerable	No	No	NA	The 'habitat constraint' for this species is 'Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' or observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature' This species breeds in caves, tunnels, mine shafts, culverts and outcrops. None of which occur in or near the Subject Land.	Unlikely. No suitable habitat in Subject Land.	Very High - 3	No
Myotis macropus Southern Myotis	Vulnerable	Yes	Yes	Recent proximal records in BioNet from the Subject Property. This species credit is assumed present.	Recent proximal records in BioNet from the Subject Property. This species credit is assumed present.	Potential. Confirmed present in the Subject Property.	High - 2	No
Petalura litorea Coastal Petaltail	Endangered	Yes	Yes	Transect survey through the Subject Land on the edge of adjacent wetland areas on 27 January 2021 and between 16 and 18 February 2021. Targeted surveys undertaken when this species typically flies revealed no individuals.	The 'habitat constraint' for this species is 'Swamps or Vegetation within 500m of swamps. Such habitat occurs in the Subject Land.	Unlikely. Targeted surveys revealed no individuals.	Very High - 3	No
Thersites mitchellae Mitchell's Rainforest Snail	Critically Endangered	Yes	Yes	Mitchell's Rainforest Snail was found in the Subject Land during targeted nocturnal spotlighting surveys in February and March 2021 (**Plate 3**).	The highest number of Mitchell's Rainforest Snail recorded in one night was 8 individuals. All were foraging in the ecotone between the Melaleuca Swamp remnants, un-mowed non-native grass (*Setaria sphacelata*), and the mowed lawns allwithin 5 metres of the existing chain wire fence that forms the boundary to the STP compound. No individuals were found elsewhere in the Subject Land.	Confirmed present in the Subject Land	Very High - 3	No
Tyto tenebricosa Sooty Owl (Breeding)	Vulnerable	No	Yes	6 nights spotlighting and call playback. 9 days of diurnal survey looking for roosts around the Subject Land. 35 nights and 38 days deployment of passive acoustic detector (SongMeter) between February and March 2021. No individuals detected.	This species requires caves or living or dead trees with hollows greater than 20 cm diameter for breeding. The Subject Land contained no suitable-size tree hollows no sandstone outcrops. The 'habitat constraint' for the species is 'Caves, Caves or clifflines/ledges|Hollow bearing trees, Living or dead trees with hollows greater than 20cm diameter'	Unlikely. No caves, clifflines, ledges or hollow-bearing trees occurred within the Subject Land.	Very High - 3	No

Table 13. Targeted Survey Timing for Species Credit Fauna that are SAII

Candidate Fauna Species	Survey Period (BAMC)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Erythrotriorchis radiatus Red Goshawk	✓	✓	✓									
Petalura litorea Coastal Petaltail	✓	✓										
Thersites mitchellae Mitchell's Rainforest Snail		CP	CP									
Key												

= Optimum survey period for Species Credit (DPIE 2021c).

✓ = Survey undertaken during appropriate survey period for Species Credit (DPIE 2019c). Species Credit not found on Subject Land.

X = Survey undertaken but not during appropriate survey period for Species Credit (DPIE 2019c). Species Credit not found on Subject Land.

AP = No appropriate targeted survey undertaken. Species Credit assumed present (AP) on Subject Land.

CP = Species Credit confirmed present (CP) on Subject Land.

Plate 3. Mitchell's Rainforest Snail recorded within the Subject Land by Land Eco Consulting (Photograph: K. Lindsay February 2021)

4.4 Targeted Species Credit Flora Surveys

This BDAR was carried out in accordance with Appendix C of the BAM (DPIE 2020). Targeted surveys were carried-out across the Subject Property for all potentially occurring threatened 'species credit' flora species that are listed 'Serious and Irreversible Impact' (SAII) under the BC Act. Targeted surveys were carried-out across the Subject Property for all potentially occurring threatened 'species credit' flora species. The suite of methods utilised is detailed (**Table 14**). Appropriate survey timing for each targeted species is presented (**Table 15**).

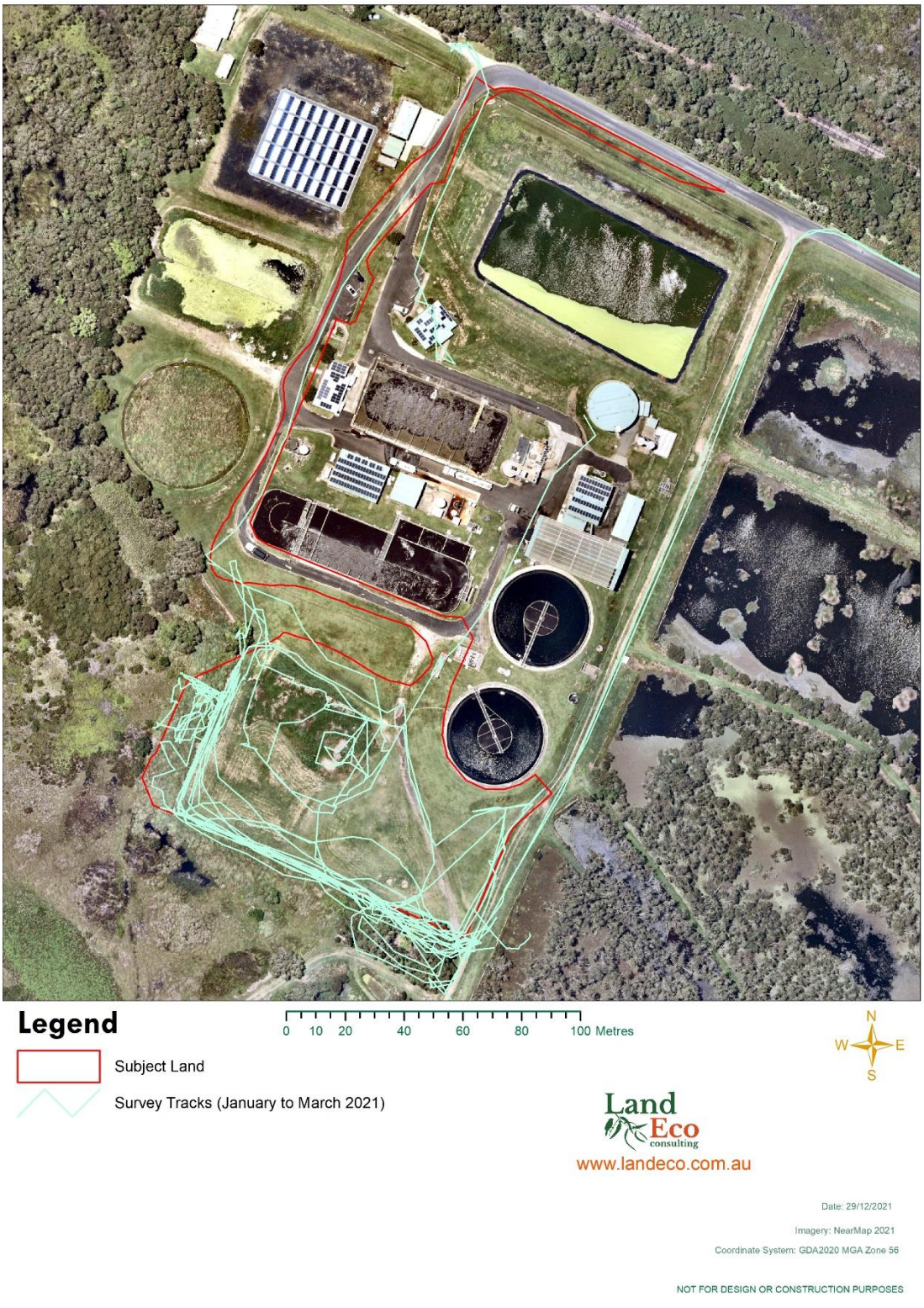

Figure 11. Flora Survey Effort undertaken by Land Eco in January, February and March 2021.

Table 14. Species Credit Threatened Flora Predicted to Occur in the Subject Land and Survey Effort Undertaken by Land Eco

Species	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land Proximity of Species Records (DPIE 2021c)	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Acacia bakeri Marblewood	Vulnerable	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Marblewood grows in or near lowland subtropical rainforest, in adjacent eucalypt forest and in regrowth of both. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Acronychia littoralis Scented Acronychia	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Scented Acronychia occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Archidendron hendersonii White Lace Flower	Vulnerable	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	White Lace Flower occurs in riverine and lowland subtropical rainforest, littoral rainforest, coastal cypress pine forest and their ecotones. It is found on a variety of soils including coastal sands and those derived from basalt and metasediments. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Caesalpinia bonduc Knicker Nut	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Knicker Nut was recently confirmed records of Knicker from Port Macquarie, South West Rocks and Yuraygir NP on the New South Wales North Coast. The species is distributed widely in the tropics and subtropics. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Cassia marksiana	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	The Brush Cassia occurs north of Brunswick Heads, around Murwillumbah, and into south-east Queensland as far as Beenleigh. Found in littoral and riverine rainforest, and in regrowth vegetation on farmland and along roadsides. It prefers more fertile soil-types and is often found in low and flat sites.	Very High - 3	No
Cryptocarya foetida Stinking Cryptocarya	Vulnerable	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Stinking Cryptocarya found in littoral, warm temporate and subtropical rainforest, wet sclerophyll forest and Camphor laural forest usually on sandy soils, but mature trees are also known on basalt soils. Coastal south-east Queensland and north-east NSW south to Iluka. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Diploglottis campbellii Small-leaved Tamarind	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Small-leaved Tamarind recorded from the coastal lowlands between Richmond River on the Far North Coast of NSW and Mudgeeraba Creek on the Gold Coast hinterland, Queensland. Confined to the warm subtropical rainforests of the NSW-Queensland border lowlands and adjacent low ranges. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Diuris byronensis Byron Bay Diuris	Endangered	No	No targeted surveys have been carried-out for this species on the Subject Land.	This orchid is known from a single location only, at Byron Bay in north-east NSW. Only about 20 plants have been recorded. Occurs in low-growing grassy heath on clay soil. Such habitat is absent from the Subject Land, which is swampy habitat on sandy-loam.	Very High - 3	No
Drynaria rigidula Basket Fern	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Occurs widely in eastern Queensland as well as islands of the Pacific and parts of south-east Asia. In NSW it is only found north of the Clarence River, in a few locations at Maclean, Bogangar, Byron Bay, Mullumbimby, in the Tweed Valley and at Woodenbong. Grows on plants, rocks or on the ground, Usually found in rainforest but also in moist eucalypt and Swamp Oak forest. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No

Species	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land Proximity of Species Records (DPIE 2021c)	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Endiandra muelleri subsp. bracteata Green-leaved Rose Walnut	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Green-leaved Rose Walnut occurs in Queensland and in north-east NSW south to Maclean. It is sparsely distributed within this range. Occurs in subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats.	Very High - 3	No
Floydia praealta Ball Nut	Vulnerable	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Ball Nut occurs in small, scattered populations distributed from Gympie in Queensland to the Clarence River in north-east NSW. Riverine and subtropical rainforest, usually on soils derived from basalt.	Very High - 3	No
Grevillea hilliana White Yiel Yiel	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	White Yiel Yiel grows in subtropical rainforest, often on basic igneous substrates. It is found north of Brunswick Heads on the north coast of NSW and in Queensland (Makinson in Harden et al. 2000). The only populations currently known in NSW are in the areas of Brunswick Heads and Tweed Heads, in small remnant areas of vegetation.	Very High - 3	No
Lindsaea fraseri Fraser's Screw Fern	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	In NSW Fraser's Screw Fern is known only from two areas - near Hastings Point on the Tweed coast and in the Pillar Valley east of Grafton. Also occurs in far north and south-east Queensland. It grows in Poorly drained, infertile soils in swamp forest or open eucalypt forest, usually as part of a ferny understorey.	Very High - 3	No
Melicope vitiflora Coast Euodia	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Coast Euodia occurs in subtropical and littoral rainforest in Queensland and reaches its southern limit in NSW, where it is largely restricted to coastal areas around Brunswick Heads and Ocean Shores, Broken Head, also in the Tweed Valley and the Nightcap Range. In NSW, it is known from a small number of locations. It is reserved in Broken Head Nature Reserve, Brunswick Heads Nature Reserve and Whian Whian State Conservation Area.	Very High - 3	No
Myrsine richmondensis Ripple-leaf Muttonwood	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Ripple-leaf Muttonwood is known only from a few populations at Coraki, Boatharbour near Lismore, and the Cherry Tree area west of Casino in subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil and alluvial deposits.	Very High - 3	No
Oberonia complanata Yellow-flowered King of the Fairies	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	This species grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves. Within NSW, there are several historical collections (all pre-1917) of this species from Byron Bay and Lismore, and a collection from Coffs Harbour from 1961. More recent observations of this species have been made from Lismore and Wollumbin.	Very High - 3	No
Ochrosia moorei Southern Ochrosia	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Southern Ochrosia is found in riverine and lowland subtropical rainforest in north-east NSW north from the Richmond River, and in south-east Queensland. It is very sparsely distributed within this range.	Very High - 3	No
Oldenlandia galioides	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	In north-east NSW, this herb is known from Whiporie State Forest south of Casino and one location in the Tweed district. Also occurs on the north-west plains of NSW and in Queensland, Northern Territory and Western Australia. It grows on margins of seasonally inundated wetlands in paperbark swamps and *Eucalyptus tereticornis* woodlands.	Very High - 3	No

Species	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land Proximity of Species Records (DPIE 2021c)	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Owenia cepiodora Onion Cedar	Vulnerable	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	North from the Richmond River in north-east NSW extending just across the border into Queensland. Subtropical and dry rainforest on or near soils derived from basalt.	Very High - 3	No
Pterostylis nigricans Dark Greenhood	Vulnerable	No	No	The Dark Greenhood occurs in north-east NSW north from Evans Head, and in Queensland. Coastal heathland with Heath Banksia (Banksia ericifolia), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soils. Such heath habitat is absent for the Subject Land.	Very High - 3	No
Rhodamnia rubescens Scrub Turpentine	Critically Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. Suitable forest habitat is absent from the Subject Land.	Very High -3	No
Rhodomyrtus psidioides Native Guava	Critically Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Syzygium moorei Durobby	Vulnerable	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Found in the Richmond, Tweed and Brunswick River valleys in north-east NSW and with limited occurrence in south-east Queensland. Durobby is found in subtropical and riverine rainforest at low altitude. It often occurs as isolated remnant paddock trees. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No
Xylosma terrae-reginae Queensland Xylosma	Endangered	Yes	A targeted survey was undertaken at the appropriate time of year (January, February and March 2021). This species was not found in or adjacent the Subject Land.	Littoral and subtropical rainforest on coastal sands or soils derived from metasediments. The species is found along coastal areas in north-east NSW from Ballina, north to the Maryborough region in Queensland. Suitable forest habitat is absent from the Subject Land.	Very High - 3	No

Table 15. Targeted Survey Timing for Species Credit Flora that are SAII

Candidate Flora Species	Survey Period (BAMC) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acacia bakeri Marblewood	✓	✓	✓									
Acronychia littoralis Scented Acronychia	✓	✓	✓									
Archidendron hendersonii White Lace Flower	✓	✓	✓									
Caesalpinia bonduc Knicker Nut	✓	✓	✓									
Cassia marksiana	✓	✓	✓									
Cryptocarya foetida Stinking Cryptocarya	✓	✓	✓									
Diploglottis campbellii Small-leaved Tamarind	✓	✓	✓									
Diuris byronensis Byron Bay Diuris	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU
Drynaria rigidula Basket Fern	✓	✓	✓									
Endiandra muelleri subsp. bracteata Green-leaved Rose Walnut	✓	✓	✓									
Floydia praealta Ball Nut	✓	✓	✓									
Grevillea hilliana White Yiel Yiel	✓	✓	✓									
Lindsaea fraseri Fraser's Screw Fern	✓	✓	✓									
Melicope vitiflora Coast Euodia	✓	✓	✓									
Myrsine richmondensis Ripple-leaf Muttonwood	✓	✓	✓									
Oberonia complanata Yellow-flowered King of the Fairies	✓	✓	✓									
Ochrosia moorei Southern Ochrosia	✓	✓	✓									
Oldenlandia galioides	✓	✓	✓									
Owenia cepiodora Onion Cedar	✓	✓	✓									
Pterostylis nigricans Dark Greenhood	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU
Rhodamnia rubescens Scrub Turpentine	✓	✓	✓									
Rhodomyrtus psidioides Native Guava	✓	✓	✓									
Syzygium moorei Durobby	✓	✓	✓									
Xylosma terrae-reginae Queensland Xylosma	✓	✓	✓									

Key

HU = Optimum survey period for Species Credit (DPIE 2019c).

R = Targeted survey not undertaken during a time stipulated on the BioNet profile for the species, but survey timing suitability was confirmed through visitation of a known reference population. Ingleside RFS Station site was visited and *Microtis angusii* was confirmed flowering in November, so surveys of the Subject Land were conducted the next day.

✓ = Survey undertaken during appropriate survey period for Species Credit (DPIE 2019c). Species Credit not found on Subject Land.

x

Candidate Flora Species	Survey Period (BAMC) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
							= Survey undertaken but not during appropriate survey period for Species Credit (DPIE 2019c). Species Credit not found on Subject Land.					
						AP	= No appropriate targeted survey undertaken. Species Credit assumed present (AP) on Subject Land.					
						CP	= Species Credit confirmed present (CP) on Subject Land.					
						HU	= Habitat in the Subject Land unsuitable for the species					

4.5 Weather Conditions During the Survey Period

Land Eco Consulting carried out on-site surveys in and surrounding the Subject Land for flora and fauna over the following dates:

- 27 January 2021,
- 16 - 18 February 2021, and
- 23 - 27 March 2021
- 15 November 2021

Weather data (BOM 2021) from this period is presented (**Table 16**).

The weather conditions were considered suitable for the survey period. Weather data from Byron weather station is presented (**Table 16**). The nocturnal fauna surveys were undertaken during intermittently moist conditions in order to target frogs, snakes, owls. Weather was considered suitable for detecting the target species.

Table 16. Weather Conditions During the Field Survey Period from Byron Bay Weather Station (BOM 2021)

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
January 1	Fr	22.2	29.8	0.8			E	50	01:00	26.1			ESE	19	1015.1	26.5			SE	17	1013.7
2	Sa	23.1	30.7	0.2			ENE	30	00:05	26.4			E	17	1013.0	30.0			ENE	19	1010.7
3	Su	21.9	30.1	0.2			NE	43	13:56	26.9			NE	9	1010.9	28.9			NE	35	1008.8
4	Mo	22.7	28.0	12.2			NE	41	23:10	25.3			NNE	19	1010.4	26.4			NE	19	1009.1
5	Tu	23.0	28.4	0			N	39	15:07	25.9			NNW	15	1009.4	28.0			N	26	1008.0
6	We	22.4	31.0	0			S	69	16:37	26.1			NNE	13	1010.6	28.9			NE	26	1008.5
7	Th	20.4	23.7	12.4			ESE	70	20:27	20.9			SSW	26	1013.4	22.0			SSW	43	1013.8
8	Fr	19.6	24.0	8.2			SSE	65	00:41	22.0			SE	33	1017.5	21.9			ESE	31	1016.1
9	Sa	19.3	24.9	1.8			E	59	01:02	23.2			ESE	30	1017.4	22.7			ESE	24	1016.5
10	Su	18.8	25.8	0.6			ENE	59	09:03	22.8			ENE	35	1017.5	25.3			E	37	1017.1
January 11	Mo	21.0	26.5	0.4			NE	54	08:43	23.7			NE	30	1017.7	25.6			NE	35	1016.5
12	Tu	20.1	29.7	0.2			NNE	33	00:51	23.3			S	15	1016.8	28.6			ENE	24	1015.6
13	We	22.5	27.7	0			ENE	44	14:11	24.6			S	13	1016.6	26.4			ESE	26	1015.9
14	Th	20.7	30.9	0			NE	31	20:35	25.0			S	4	1014.5	29.7			E	19	1012.1
15	Fr	22.4	27.8	0			N	54	18:09	26.1			NE	13	1009.8	27.5			N	30	1006.4
16	Sa	21.2	27.9	8.0			S	52	10:26	25.0			NNW	13	1006.9	26.9			SE	22	1007.9
17	Su	21.7	31.2	0.2			NE	35	20:51	25.4			E	9	1014.4	30.8			ENE	17	1013.5
18	Mo	24.6	29.4	0			NE	41	11:39	26.5			NE	24	1015.2	25.3			NNE	11	1013.1
19	Tu	19.4	30.0	31.0			ESE	61	21:52	23.9			N	6	1014.1	29.7			ENE	11	1012.9
20	We	21.4	24.3	2.2			E	59	23:39	23.2			E	41	1019.2	24.1			SE	22	1019.2
21	Th	18.6	27.5	4.8			ENE	39	23:09	19.7			SSW	15	1019.4	25.3			ENE	19	1017.3
22	Fr	19.4	28.6	0.2			NE	35	15:31	23.4			Calm		1015.6	26.3			NNE	22	1012.9
23	Sa	20.2	30.9	0			N	31	23:03	24.7			NNW	9	1015.4	30.5			ENE	17	1014.6
24	Su	21.7	30.9	0			NE	41	19:26	23.4			SW	9	1016.3	30.2			ENE	17	1014.0

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
25	Mo	22.0	29.8	1.2			NE	39	11:58	22.4			WNW	7	1013.5	28.7			NE	31	1011.0
26	Tu	20.4	31.5	0.2			NE	48	19:38	25.5			NNW	9	1009.8	28.4			NNE	22	1007.0
27	We	23.6	30.5	0			NE	37	13:49	26.3			NNE	13	1009.9	28.8			NE	30	1009.3
28	Th	23.8	29.4	0			ENE	46	20:20	26.5			E	31	1014.0	27.7			E	28	1013.2
29	Fr	23.7	31.0	0			ENE	50	00:39	26.4			ENE	28	1014.0	28.0			ENE	22	1012.6
30	Sa	23.2	30.3	0			NE	39	23:00	26.7			ENE	13	1013.7	28.5			E	11	1012.5
31	Su	23.3	30.6	0			NE	41	23:28	26.5			ENE	13	1013.9	28.5			ENE	15	1013.2

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
February 1	Mo	23.2	28.8	0				46	22:35	26.1			NE	24	1014.6	27.4					1012.8
2	Tu	20.9	25.5	0.2				33	23:01	24.1					1009.9	21.6					1008.3
3	We	20.6	26.8	21.8				44	00:54	23.5					1011.8	26.4					1011.4
4	Th	19.7	29.1	0				31	23:02	23.7					1013.4	26.9					1011.8
5	Fr	21.0	29.3	0.2					13:38	24.4					1012.8	28.0			E	22	1010.4
6	Sa	21.1	31.2	0.4			ENE	28	22:12	23.5			SSW	7	1009.6	30.8			E	15	1006.2
7	Su	23.5	32.5	0.2			SSW	46	22:13	25.9			N	7	1006.1	30.5			ENE	20	1003.5
8	Mo	22.5	26.3	17.0			SSE	56	21:22	24.6			S	35	1010.2	25.8			S	41	1009.6
9	Tu	23.3	26.0	0			SE	59	20:47	24.3			S	44	1013.9	24.6			SSE	33	1012.4
10	We	19.8	26.3	0			SE	61	23:41	24.0			ESE	30	1014.0	23.9			S	24	1012.7
11	Th	18.2	26.7	11.4			ESE	37	13:46	19.1			WSW	22	1015.2	25.5			ESE	28	1013.2
12	Fr	19.0	27.1	0.2			N	50	22:04	24.1			NNW	7	1013.9	26.1			NNE	24	1011.4
13	Sa	23.6	28.0	0			NNE	52	12:40	25.0			N	26	1009.9	26.5			NNE	31	1007.2
14	Su	21.3	24.4	43.4			SSE	89	10:52	23.9			SSW	41	1008.2	22.6			S	56	1009.5
15	Mo	18.0	25.1	3.8			SSW	63	23:09	18.4			WSW	26	1013.9	23.7			S	50	1012.5
16	Tu	18.0	24.6	10.6			ESE	74	13:33	23.2			SE	30	1014.7	23.1			ESE	43	1014.1
17	We	19.6	25.0	18.8			SSE	80	15:50	22.1			E	48	1016.3	22.2			SSE	54	1016.4
18	Th	20.6	26.7	10.2			ESE	65	23:55	24.6			E	43	1017.1	26.0			SE	39	1016.2
19	Fr	22.2	25.0	5.6			E	67	06:28	24.0			E	37	1016.0	24.3			ENE	13	1013.4
20	Sa	20.2	25.7	87.4			SSE	54	23:16	21.5			SW	15	1013.1	24.6			SSW	30	1009.4
21	Su	20.7	25.8	5.8			SW	67	10:37	21.3			SW	35	1004.8	23.5			SW	26	1002.7
22	Mo	21.3	31.2	1.0			SW	41	23:24	25.7			SW	7	1005.6	30.7			E	15	1004.8
23	Tu	24.7	29.2	0			NE	70	19:34	26.2			N	13	1009.6	27.8			NE	33	1008.2
24	We	21.1	28.4	7.4			E	39	19:25	22.7			SSW	13	1014.8	25.8			NE	31	1013.9
25	Th	22.7	29.5	0.2			NE	41	15:24	25.7			E	17	1014.1	27.2			NE	31	1011.5
26	Fr	23.3	29.4	1.6			NE	39	02:08	26.0			N	11	1011.3	28.4			NNE	19	1009.8
27	Sa	23.9	30.7	0.2			NNE	31	22:59	26.4			NNE	6	1012.7	28.5			E	11	1011.3
28	Su	23.5	31.2	0			NNE	33	23:05	25.9			WSW	9	1012.5	28.9			NE	28	1010.5

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
March 1	Mo	23.9	31.1	0			NNW	28	00:01	25.6			E	6	1010.9	27.7			NNE	17	1009.2
2	Tu	21.6	30.7	7.8						24.9			NNW	13	1009.0	26.2			SSW	41	1008.0
3	We									23.9			E	35	1011.7	23.9	65		ESE	13	1012.1
4	Th	18.3	24.8							19.4	90		S	28	1013.8	23.8	56		SE	24	1011.9
5	Fr	18.4	29.4	0.2			ESE	50	22:52	23.2	68		N	9	1008.3	28.4	62		NE	24	1005.1
6	Sa	19.1	24.1	6.2			SE	56	23:19	19.9	89		SSW	24	1010.1	23.1	68		SE	24	1010.2
7	Su	18.8	28.0	4.8			NE	46	19:03	20.8	86		SW	17	1015.8	26.4	67		ENE	15	1013.9
8	Mo	20.8	26.5	0.8			N	54	16:53	23.9	82		N	20	1017.0	25.9	74		N	33	1013.6
9	Tu	19.5	28.7	13.6			WSW	54	19:29	21.4	94		NNW	13	1014.9	27.4	76		NNE	19	1012.3
10	We	20.6	25.9	2.4			SE	46	16:58	23.3	85		SW	20	1018.2	25.6	82		S	30	1017.6
11	Th	19.2	23.2	31.8			NE	39	01:24	21.3	97		SSW	9	1020.8	21.7	94		S	11	1020.1
12	Fr	19.8	26.5	17.0			NE	39	11:39	21.4	95		SSW	9	1020.1	23.5	82		N	19	1018.1
13	Sa	21.2	27.2	2.8			NE	37	14:35	22.4	93		SW	6	1018.1	27.0	72		NE	26	1015.4
14	Su	22.4	27.2	0			NNE	50	13:43	24.7	84		N	22	1013.8	26.1	80		NNE	31	1010.7
15	Mo	18.7	22.9	27.0			S	65	17:16	18.7	100		SW	33	1016.4	20.2	100		SSW	41	1016.3
16	Tu	18.6	22.9	10.8			S	61	02:55	22.8	65		SSE	30	1021.0	21.1	93		S	46	1019.7
17	We	19.4	23.2	3.6			ESE	61	08:40	19.5	100		ESE	24	1019.5	21.3	97		E	41	1017.3
18	Th	18.9	25.2	14.6			E	57	17:27	20.1	100		SW	15	1017.3	24.3	92		E	13	1016.1
19	Fr	19.3	28.7	18.6			WSW	39	01:32	21.0	100		WNW	9	1016.7	28.1	85		E	15	1015.4
20	Sa	19.9	24.9	41.0			NE	39	23:27	21.5	100		WSW	13	1017.8	22.0	100		SE	13	1016.6
21	Su	21.3	24.0	14.2			ENE	63	14:29	23.8	100		E	20	1018.2	21.7	100		ENE	41	1017.5
22	Mo	20.3	22.2	134.2			E	61	22:29	21.1	100		E	24	1019.2	21.1	100		ENE	33	1016.4
23	Tu	20.0	24.3	37.4			NE	74	09:36	21.3	100		NE	54	1011.3	21.7	100		NNE	44	1006.2
24	We	20.9	29.6	35.6			W	46	16:05	24.3	97		NW	9	1003.6	28.6	74		NNW	9	1000.7
25	Th	20.3	29.1	0			WSW	46	03:13	22.6	78		W	15	1006.8	27.6	58		NNE	13	1005.2
26	Fr	19.9	24.1	0			SSW	41	12:39	21.6	73		SW	26	1013.2	23.3	74		S	33	1012.0
27	Sa	18.8	28.4	0			NE	43	17:11	20.5	93		WSW	15	1015.2	26.8	78		NE	22	1012.4
28	Su	20.4	25.9	0			ESE	31	19:03	22.4	74		WSW	19	1016.4	24.0	86		S	20	1014.8
29	Mo	19.8	26.3	0			SW	31	07:36	20.9	92		SW	20	1017.9	25.3	81		SE	19	1016.0
30	Tu	17.7	23.2	6.2			ESE	57	10:52	18.6	100		SW	20	1019.5	20.9	99		S	30	1018.7
31	We	15.6	21.6	41.4			SSW	76	15:14	17.3	100		SW	33	1019.9	21.3	94		SSW	48	1018.6

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Mo	18.0	25.8	0			E	46	00:49	19.5	65		E	19	1026.9	24.2	49		E	19	1024.7
2	Tu	17.5	24.2	0			E	43	20:06	20.1	69		ENE	17	1026.4	21.5	65		ENE	15	1025.4
3	We	18.4	26.3	0.2			ESE	37	00:50	22.4	61		E	19	1026.5	25.4	50		E	22	1024.3
4	Th	18.2	27.0	0			NE	30	22:40	23.5	57		E	13	1023.2	24.3	53		ENE	13	1020.6
5	Fr	18.7	25.7	0			ENE	43	08:29	20.7	73		E	19	1021.0	24.5	54		ENE	20	1018.6
6	Sa	16.4	23.8	3.2			NE	35	17:52	18.2	94		WNW	7	1017.8	22.1	69		NNE	11	1014.7
7	Su	17.9	23.8	0.2			NNE	52	14:37	21.7	82		NNE	19	1012.9	23.3	76		NNE	33	1010.1
8	Mo	19.7	23.3	11.4			N	50	06:07	20.0	98		N	31	1008.3	21.3	91		N	22	1006.2
9	Tu	18.9	27.5	2.8			ENE	30	18:30	21.9	78		SSW	17	1012.4	25.9	63		E	19	1011.2
10	We	20.8	25.3	0			NNE	54	19:40	24.1	81		NE	26	1012.9	23.2	91		NE	33	1009.4
11	Th	20.9	24.2	10.0			N	50	23:56	22.4	96		N	24	1005.6	22.6	92		WNW	11	1004.6

12	Fr	20.7	25.1	3.4			N	65	05:20	22.6	89	NNW	19	1002.0	22.9	87	N	35	998.4
13	Sa	16.3	27.4	0.6			W	61	09:24	19.3	47	W	22	1006.4	25.7	28	WNW	24	1004.6
14	Su	15.5	26.8	0			NE	46	12:09	20.7	45	N	4	1012.2	23.8	47	NE	31	1008.6
15	Mo	17.5	28.3	0			NE	46	13:54	23.0	33	N	11	1012.4	24.2	46	NE	35	1008.6

4.6 Species Polygon

The following species credit species are known to exist in the Subject Property, and three of these species were observed in or immediately adjacent the Subject Land during the targeted survey component of this study, they are:

- *Crinia tinnula* (Wallum Froglet) (BC Act: Vulnerable)
- *Litoria olongburensis* (Wallum Sedge-frog) (BC Act: Vulnerable; EPBC Act: Vulnerable)
- *Thersites mitchellae* (Mitchell's Rainforest Snail) (BC Act: Endangered/SAll; EPBC Act: Critically Endangered)
- *Myotis macropus* (Southern Myotis) (BC Act: Vulnerable)
- *Planigale maculata* (Common Planigale) (BC Act: Vulnerable)

A species polygon has been assigned for these species (**Appendix D**). The species polygon entails the entirety of the native vegetation impacted by the development (0.52 hectares).

5. Impact Summary

This chapter of the report details the type and extent of impacts to biodiversity that will occur as a result of the proposed development.

5.1 Serious and Irreversible Impacts (SAII)

In accordance with section 7.16 of the BC Act, a proposed development or activity that has serious and irreversible impacts (SAII) on biodiversity values is defined as any serious and irreversible impacts on biodiversity values as determined under section 6.5 of the BC Act that would remain after the measures proposed to be taken to avoid or minimise the impact on biodiversity values of the proposed development or activity.

The consent authority must refuse to grant consent under Part 4 of the *Environmental Planning and Assessment Act 1979*, in the case of an application for development consent to which this Division applies (other than for State significant development), if it is of the opinion that the proposed development is likely to have serious and irreversible impacts on biodiversity values.

If the Minister for Planning is of the opinion that proposed State significant development or State significant infrastructure that is the subject of an application to which this Division applies is likely to have serious and irreversible impacts on biodiversity values, the Minister:

(a) is required to take those impacts into consideration, and

(b) is required to determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted.

If the determining authority is of the opinion that the proposed activity to which this Division applies is likely to have serious and irreversible impacts on biodiversity values, the determining authority:

(a) is required to take those impacts into consideration, and

(b) is required to determine whether there are any additional and appropriate measures that will minimise those impacts if the activity is to be carried out or approved.

5.1.1 SAII Threatened Ecological Communities

No threatened ecological communities occur within the Subject Land. There will be no loss of any extent of threatened ecological community because of the proposed development. Indirect impacts to nearby vegetation have been managed under the guidance of a qualified Consulting Arborist (Northern Tree Care 2021).

5.1.2 SAII Threatened Species

Mitchell's Rainforest Snail is the only SAII that occurs within the Subject Land (**Figure 10**).

All of the Mitchell's Rainforest Snail observed during the targeted survey effort, were found solely on the periphery of the development and in the adjacent native vegetation outside of the development footprint. No Mitchells Rainforest Snail were observed in the mowed grassland inside the STP compound (**Figure 10**).

A determination of whether the proposed impacts are serious and irreversible have been undertaken in accordance with section 3.2 of the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (OEH 2017b) (**Table 17**). The final determination of whether an impact is serious and irreversible lies with the consent authority.

A referral to the Commonwealth resulted in the decision by the Commonwealth Environment Minister that the proposed development would not significantly impact Mitchells Rainforest Snail on a Commonwealth level. This decision is a relevant consideration when assessing the likelihood of an SAII upon this species.

Table 17. Serious and Irreversible Impact Assessment for Mitchell's Rainforest Snail

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species at risk of SAII Mitchell's Rainforest Snail (*Thersites mitchellae*)		
BC Act Status: Endangered		
1. The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII	The proposed development site was selected by Council to avoid and minimise overall impacts. The first design iteration included a water holding pond which would have removed native vegetation to the south of the development, however, on receiving expert Ecologist advice, Council opted to redesign to avoid all remnant vegetation. Not a single native tree or shrub will be removed to facilitate the development. A qualified Consulting Arborist has confirmed that all trees adjacent to the Subject Land can be retained and protected during and post development (Northern Tree Care 2021).	
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: 2 a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:	i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or	Museum collections from last century show the Mitchell's Rainforest Snail was previously common within its range, but has since declined in abundance. Since this time, much of the habitat that the species occupied, remnant lowland subtropical rainforest and swamp sclerophyll forest, has been cleared. Recent research shows that Mitchell's Rainforest Snail now has a restricted and fragmented geographic distribution, with an area of occupancy estimated to be less than 5km2, and a low number of individuals, with a population of less than 500 mature individuals. Ongoing decline is projected due to continuing degradation of habitat (Threatened Species Scientific Committee 2002). BioNet states: "There have been increasingly more sites discovered due to increased survey/observation, particularly in and around Kingscliff and Byron areas (DPIE 2021c) Recent expert advice from Malacologist Dr Stephanie Clarke regarding a nearby project states: "It *is also very reasonable to assume that the total number of individuals of the species across its known range is significantly higher even than the 5000 number suggested recently by Dr Parkyn. This assumption is based on the difficulty of searching some of its preferred habitat eg clumps of Gahnia, both during the day but especially at night when the species is most active, but also based on the authors recent surveys efforts with this species further north and the related threatened snail species Meridolum corneovirens and Pommerhelix duralensis (which when listed was thought to be almost as scarce as Thersites mitchellae*)." (Clarke 2019)
	ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites	See 2i
2 b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:	i. an estimate of the species' current population size in NSW, and	Recent expert advice from Malacologist Dr Stephanie Clarke regarding a nearby project states: "*It is also very reasonable to assume that the total number of individuals of the species across its known range is significantly higher even than the 5000 number suggested recently by Dr Parkyn. This assumption is based on the difficulty of searching some of its preferred habitat eg clumps of Gahnia, both during the day but especially at night when the species is most active, but also based on the authors recent surveys efforts with this species further north and the related threatened snail species Meridolum corneovirens and Pommerhelix duralensis (which when listed was*

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species at risk of SAII Mitchell's Rainforest Snail (*Thersites mitchellae*)		
		thought to be almost as scarce as Thersites mitchellae)." (Clarke 2019)
	ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and	See 2i
	iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations	See 2i
2 c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:	i. extent of occurrence	The extent of occurrence of Mitchell's Rainforest Snail is estimated to be less than 400 km^2 (Threatened Species Scientific Committee 2002).
	ii. area of occupancy	Its current area of occupancy is estimated to be less than 5 km2 , which indicates a severely restricted distribution (Threatened Species Scientific Committee 2002).
	iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and	Recent research has found Mitchell's Rainforest Snail occurs at a number of sites at five locations (Stotts Island, Banora Point, Byron Bay, Suffolk Park and Lennox Head) distributed along the coastal plain of northern NSW. The largest known population, and largest remaining area of habitat, is in Stotts Island Nature Reserve. The status and occurrence of Mitchell's Rainforest Snail and its habitat on Stotts Island was investigated by the NSW NPWS and Queensland Museum in 1999. The total subpopulation on Stotts Island is estimated to be several hundred, and its long-term viability is considered good. It is claimed that the number of mature individuals within this population is less than 250. Other subpopulations are considerably smaller - most occur in very small habitat remnants and are known from between one and three specimens. (Threatened Species Scientific Committee 2002). A recent targeted survey of Mitchell's Rainforest Snail was undertaken in Byron Bay between Eingsdale Road in the north, Ti Tree Road in the south-west, Mahogany Drive in the south-west and Johnson Street in the North East (Geolink 2019). The study identified Mitchell's Rainforest Snail at 7 sites. It was suggested that these sites all form part of the one larger population.
	iv. whether the species' population is likely to undergo extreme fluctuations	Studies undertaken to date suggest that Mitchell's Rainforest Snail populations remain stable in suitable habitat (Threatened Species Scientific Committee 2002; Parkyn et al. 2012).
2 d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:	i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	It is thought that Mitchell's Rainforest Snail could be easily translocated to new locations (Stanisic 1999 in NSW NPWS 2001), provided suitable climatic and microhabitats occur (e.g Gahnia spp., Bangalow Palm Fronds) (Stanisic 1999 in NSW NPWS 2001; Parkyn et. Al. 2012).
	ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	This species is not reliant on abiotic factors, however is reliant on specific climatic and microclimatic conditions (NSW NPWS 2001; Threatened Species Scientific Committee 2002).

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species at risk of SAII Mitchell's Rainforest Snail (*Thersites mitchellae*)		
	iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	The ability to control key threatening processes at a biodiversity stewardship site is high. Habitat loss, fragmentation and disturbance have been cited as the main threats to Mitchell's rainforest snail, and these threats have likely had the greatest historical impact on the species (NSW NPWS 2001). Additional cited threats are the impacts of fire, invasion of exotic weeds, and predation by feral animals (NSW NPWS 2001, DPIE 2021d). All of these threats can be managed on biodiversity stewardship sites.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.		N/A
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: **4a. the impact on the species' population (Principles 1 and 2) presented by:**	i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and	During the targeted survey period the maximum number of Mitchell's Rainforest Snail recorded in the Subject Land over one survey evening was of 8 individual land snails. Six of these individuals were located in the ecotone between the mowed and unmoved exotic grassland surrounding the southern and western sides of the Subject Land, two of these individuals were on leaf litter beneath *Melaleuca quinquenveria* trees located immediately outside of the Subject Land. The conditions during this survey evening were moist and wet in February 2021. A maximum of three Mitchell's Rainforest Snail were found during all other survey nights. It is expected that a maximum density of 8 mature Mitchell's Rainforest Snail inhabits the Subject Land (0.52 hectares). Studies from the surrounding area have identified the vegetation surrounding the Subject Land as being suitable for Mitchell's Rainforest Snail (Geolink 2019). It is expected that the species occurs throughout Tyagarah Nature Reserve and the West Byron BioBank Site.
	ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or	It is expected that a maximum of 8 mature Mitchell's Landsnails will be impact by the proposal. A conservative total species population in NSW estimate is 5000 individuals, however Malacologist Dr Stephanie Clarke (2019) believes this population to be considerably larger. Assuming the proposal destroyed 8 individual mature Mitchell's Landsnails and another 8 juveniles, approximately 0.32% of the total population would be impacted. However, since the total species population in NSW is expected to be larger, then the percentage of the total population expected to be impacted will likely be lower than 0.32%.
	iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal	See 4i
4b. impact on geographic range (Principles 1 and 3) presented by:	i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW	The maximum area of the species geographic range to be impacted by the proposal is 0.52 hectares. The estimated area of occupancy (AOO) is 5km^2 which is 500 hectares. The total percentage of AOO to be impacted by the proposal is 0.18%.
	ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted	The proposed development will not eliminate all individuals. This is because pre-clearing surveys will be undertaken over several days and nights leading up to the clearing. During these surveys, snails will be captured and safely relocated to suitable habitat in the Subject Property no less than 50 metres from the development footprint.

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species at risk of SAII Mitchell's Rainforest Snail (*Thersites mitchellae*)		
	iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	Nightly movements of up to 21.72m have been recorded and studies have found that the Mitchell's Rainforest Snail behaviour is nomadic and that they have relatively high dispersal ability (Murphy 2002, cited in Parkyn et. al. 2012). The two closest 'nucleus' habitats to the Subject Land are clumps of *Melaleuca quinquenervia* trees. These remnant vegetation patches will be retained, protected during and post development. A matrix of grass and wetland vegetation will continue to join these remnant vegetation clumps to the south and east of the proposed development. It is expected that the local subpopulation of Mitchell's Rainforest Snail will continue to utilise the remnant *Melaleuca quinquenervia* vegetation, along with the matrix which joins these clumps. Therefore, no fragmentation of the subpopulation will take place.
	iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	Since the most suitable habitat for Mitchell's Rainforest Snail will continue to remain it is not expected that threats will affect the remaining subpopulation of Mitchell's Rainforest Snail. As the habitat is located immediately adjacent a managed STP compound, it is not expected that fire regimes will change. Neither will hydrology. Pollutants are not likely to increase significantly beyond those already subject to the habitat of the Mitchell's Rainforest Snail at this location. Regular herbicide spraying, and localised stockpiling of biosolids takes place within the Subject Land. This will continue occur regardless of whether the development proceeds. The habitat occupied by the Mitchell's Rainforest Snail in the Subject Land is already severely edge effected with dense infestations of shrub and groundcover weeds. Three species of introduced exotic pest slugs and snails were both observed in high density utilising the same habitat as Mitchell's Rainforest Snail. No interactions were observed. It is not expected that the proposed development would increase any pest, disease or parasites that could affect Mitchell's Rainforest Snail.

5.2 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the Subject Land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. The indirect impacts of this proposed development are outlined in **Table 18.**

Table 18. Indirect Impacts Summary

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	All potentially occurring threatened fauna. Swamp Sclerophyll Forest EEC.	It is possible that native vegetation adjacent the development could be inadvertently impacted during construction. Such impacts would be localised can be avoided through implementation of the appropriate impact mitigation measures set-out in this report.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts (if any) will be minor, localised and unlikely to increase beyond the current base-level of impacts (such as routine mowing) in the Subject Land.
(b) reduced viability of adjacent habitat due to edge effects	All potentially occurring threatened fauna. Swamp Sclerophyll Forest EEC.	The Subject Land is already the subject of edge effects. It exists on the periphery of a functioning STP. The entirety of the Subject Land is managed through routine slashing and mowing as part of STP maintenance. The proposed facility is located adjacent to native vegetation; however, it is not expected that edge effects will occur significantly beyond those currently occurring in the Subject Land.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts (if any) will be minor, localised and unlikely to increase beyond the current base-level of impacts (such as routine mowing) in the Subject Land.
(c) reduced viability of adjacent habitat due to noise, dust or light spill	All potentially occurring threatened fauna.	The existing STP produces noise, vibration and light throughout the day and night. Increased noise, vibration and light will occur during construction works; however, this will be limited to construction and operation hours. **Light** The proposed BEF will require lighting to illuminate the office and accessways, especially during the winter months when days are shorter, and afternoons are dark. Generally lighting will be limited to operational hours. Other than security lighting, no lights will operate at night after work hours. Lighting will be concentrated into areas of vehicle and foot traffic and will be designed to shine away from habitat for fauna (i.e. waterbirds and frogs). There is possibility that birds may collide with the buildings that are erected. This issue arises for any building positioned in an area that birds frequent. Windows pose the greatest collision threat to birds, especially when lights are left on. Windows are not a significant feature in the proposed design, and lights will be turned off when the building is not occupied at night. **Dust** Dust is not likely to be problem at this location owing to the existing levels of moisture in the soils at this location. Water trucks will be available for suppression in the event dust is detected. All raw materials (waste) will be received in a fully enclosed building with its own air treatment system. Finished compost may be stored in the existing covered	There will be no consequences of the impacts for the bioregional persistence of the threatened species and their habitats. Impacts (if any) will be minor, localised and unlikely to increase beyond the current base-level of impacts from existing STP operations in the Subject Land.

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
		biosolids storage area, but will be discharged at a controlled moisture content of approximately 40%, which does not generate significant dust when handled. All access roads and turning areas are sealed. **Noise and Vibration** It is not expected that the proposed BEF will contribute noise, light or vibration that would cause any significant impact to locally occurring fauna, including wetland birds. A Noise and Vibration Impact Assessment (NVIA) was prepared for the proposed BEF. Noised modelling using SoundPLAN v7.4 predicted no impacts from mechanical noise on nearby sensitive receivers. Mechanical services noise levels are mitigated by enclosure in technical corridors that attenuate the noise. Mechanical services noise levels will be reviewed during the detailed design of the facility to confirm compliance with NSW Noise Policy for Industry (NPI) 2017. The effects of traffic noise on birds is complex, and opinions in the scientific literature vary. While it usually assumed that noise associated with traffic including heavy vehicle operation could increase disturbance to birds, multiple studies have shown that it is not the noise from traffic that significantly effects bird presence, breeding and behaviour but other effects, most noticeably vehicle strike/collision (Summers et al 2011). The effects of collision upon fauna will be actively managed through the position of the access road away from fauna usage areas. Low speed limits will be enforced from Wallum Place into the STP and BEF compound. The effects of noise from heavy vehicle movement will be significantly mitigated, by enforcing maximum speed limits and stringent rules to reduce heavy vehicle noise emission such as implementing bans upon (or enforcing minimisation) the emission of compression ('jake') and exhaust brake noise from heavy vehicles when such vehicles pass wetland bird habitat areas. Owing to the topography of the site it is not likely that exhaust /compression breaking will be require at all. Other mitigation measures may include, ensuring trucks have rubber-lined trays (or similar noise reducing measures). Tipping of materials will not likely generate noise that will disturb threatened fauna as the tipping will incur into an indoor (enclosed) facility and the materials being tipped consist of organics which make no abrupt or sharp noise when tipped onto a hard surface. Noise from the fans and pumps associated with the Bioenergy Facility (BEF) will be minimal as noise mitigation measures will be put in place, for example, wherever possible such noise-emitting plant will be enclosed within a noise attenuated building. For example, all noise emitting plant and equipment operates within buildings with doors closed and no windows. The construction works would be undertaken in accordance with the Interim Construction Noise Guideline (DECCW 2009) and would typically occur during the standard construction and operational hours between: • 0700 to 1800 hrs Monday to Friday; and • 0800 to 1300 hrs on Saturdays. There will be no construction works on Sundays or public holidays.	

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
		If Council is notified of any breeding by threatened bird species near the development site (e.g. Comb-crested Jacana at H-cell) Council will engage a suitably qualified person to advise the best course of action to reduce potential for indirect impacts.	
(d) transport of weeds and pathogens from the site to adjacent vegetation	All native flora species. Wallum Sedge-frog Wallum Froglet Swamp Sclerophyll Forest EEC.	The Subject Land is dominated by weeds including multiple HTW, priority and Weeds of National Significance. Pathogens including Chytrid fungus and Myrtle rust are expected to already occur in the Subject Land, however care will be taken to prevent accidental introduction of pathogens regardless of whether pathogens already occur within the Subject Property.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts (if any) will be minor, localised and unlikely to increase significantly beyond the current base level weed and pathogen assemblages and composition.
(e) increased risk of starvation, exposure and loss of shade or shelter	Wallum Sedge-frog Wallum Froglet Mitchell's Rainforest Snail	The proposed development will remove an area of dense, weed-dominated grassland, and this may displace threatened snail and frogs, along with other non-threatened vertebrates however, extensive suitable habitat will continue to exist surrounding the entire development. The impacts from the loss of this marginal habitat are not expected to significantly exceed those impacts that take place on a regular basis through routine slashing and mowing of the Subject Land which is a requirement of STP maintenance.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts will be minor, localised and unlikely to increase beyond the current base-level of impacts from existing STP operations in the Subject Land.
(f) loss of breeding habitats	Wallum Sedge-frog Wallum Froglet Mitchell's Rainforest Snail	The proposed development will cause the loss of derived grassland vegetation that may be used as breeding habitat for threatened frogs and snail, however, this habitat consists entirely of exotic-dominated grassland which is of low overall habitat value when compared to the remnant Melaleuca Swamp and Wallum habitats that occur adjacent.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts will be minor, localised and unlikely to increase beyond the current base-level of impacts from existing STP operations in the Subject Land.
(g) trampling of threatened flora species	Nil	N/A	N/A
(h) inhibition of nitrogen fixation and increased soil salinity	Wallum Sedge-frog Wallum Froglet Mitchell's Rainforest Snail	**Salinity** The proposed development is not likely to interfere with salinity of the locality. The soils at this location are naturally saline owing to the proximity to the ocean, the origin of the sediments (windblown oceanic sediment) and the constant influence of ocean haze. **Nitrogen Fixation** The proposed development will not impact upon the natural nitrogen fixation processes of the vegetation surrounding it. The footprint of the development will be concrete hardstand however, this impact is limited to a small area of historically cleared and disturbed wasteland. **Acid Sulphate Soils** The locality forms part of a complex of acidic coastal heath wetlands and swamp sclerophyll forests. The native biodiversity in these areas is sensitive to changes in hydrology and water quality (notably pH). The excavation and treatment of Acid Sulphate Soils (ASS) on the site has little potential to have neutralisation effects on the adjacent wetland areas and this will not impact pH-sensitive biodiversity such as Wallum Sedge-frog and Wallum Froglet. Wallum Froglet and Wallum Sedge-frog are commonly referred to as 'acid frogs'. These species have evolved to	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
		tolerate the strongly acidic conditions that exist in wallum heath and similar coastal wetlands. Wallum soils are described as being unusually oligotrophic and acidic (pH 3.4–5.5) (Filer et al 2020). The acidity of these habitats is caused by the geology and geomorphology of the location containing ion-poor water with high levels of dissolved organic acids and ASS (see Filer et al 2020). There is low risk of ASS having 'neutralisation effects' on an already acidic environment. ASS is itself acid-forming, and its accidental release could only increase the acidity (reduce the PH) of the water within the wetlands. It is considered extremely unlikely that Acid Sulphate Soils (ASS) could be uncovered and allowed to contaminated surface water and run-off the site in a manner that would cause significant acidification of the surrounding wetland habitat, that is to cause the pH of the wetlands surrounding the site to fall below 3.4 pH. The risks of release of ASS (or any chemicals, such as alkaline neutralisers used to treat ASS) during and post construction have been studied in the design and engineering phase of the project (Douglas Partners 2021). It is expected that screw pile foundations will be used for the facility, this will reduce bulk excavations at depth and the likelihood that any ASS or acidic groundwater will need to be treated. If ASS is found during excavation, it will be treated within a designated treatment pad area. Leachate and/or runoff from rainfall will be captured in a lined basin and pumped out to a mobile tanker for disposal to a suitably licenced facility. The ASS treatment pad size and location, including retention on site of a 100yr storm event is noted in the updated construction soil and water management plan (CSWMP) prepared by MPC. No ASS or treatment chemicals will be released into the receiving environment. The Acid sulphate Soil Management Plan (ASSMP) has been prepared Douglas Partners (2021) to provide details of the treatment methodology. Any contaminated water will be captured and retained on-site, pumped out and disposed of to a suitably licensed facility. In the unlikely event of a spill, emergency response procedures will be implemented to ensure chemicals do not run off into adjoining wetland areas as a matter of priority.	
(i) fertiliser drift	Nil	N/A	N/A
(j) rubbish dumping	Nil		N/A
(k) wood collection	Nil	N/A	N/A
(l) bush rock removal and disturbance	Nil	N/A	N/A
(m) increase in predatory species populations	Wallum Sedge-frog Wallum Froglet Mitchell's Rainforest Snail	It is not considered likely that predatory species will increase in species richness or population size as a result of the proposed development. The Subject Land contains a high species richness of native diurnal and nocturnal predatory birds along with native frogs and reptiles. Land Eco identified the Cane Toad and Black Rat in high abundance throughout the Subject Land during the survey period. It is not expected that the proposed development will increase the population of Cane Toad or Black Rat.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts (if any) will be minor, localised and unlikely to increase significantly beyond the current base level predatory species assemblages and composition.

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(n) increase in pest animal populations	Wallum Sedge-frog Wallum Froglet Mitchell's Rainforest Snail	Land Eco identified the Cane Toad and Black Rat in high abundance throughout the Subject Land during the survey period. It is not expected that the proposed development will increase the population of Cane Toad or Black Rat.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts (if any) will be minor, localised and unlikely to increase significantly beyond the current base level predatory species assemblages and composition.
(o) increased risk of fire	All threatened species. Swamp Sclerophyll Forest EEC.	There is potential for any development to cause increased risk of fire as a result of the activity of internal combustion engines during construction and operation. The risk will increase slightly higher than current base levels in the STP as the use of machinery and vehicles increases during the construction phase of the project. In the event a bushfire takes place, it is expected that it will be localised, as the development is surrounded by permanent artificial waterbodies and wetlands. Swamp Sclerophyll Forest EEC burns more frequently than other vegetation types and has evolved under the influence bushfire, thus, it is not expected that a fire event is likely to significantly impact local occurrences of Swamp Sclerophyll Forest EEC. A Bushfire Risk Assessment (BRA) (Bushfire Risk 2021) was prepared for the EIS to determine category of bushfire attack and construction level in support of the Proposal. 'Bushfire attack level', or BAL, quantifies the level of bush fire risk for a development. The vegetation surrounding the proposed BEF is protected due to its biodiversity values. A small part of the proposed BEF sits within BAL-FZ (direct exposure to flames from fire front). Additional clearing is not proposed as the area is considered to have high biodiversity value. The EIS presents a range of mitigation measures to manage the bushfire risks identified. The biogas storage dome is being constructed from a polyurethane membrane and thus is not consistent with general BAL-29 requirements as set out in the Building Codes of Australia. Therefore, additional bushfire suppression systems have been adopted to mitigate bushfire risk. The position of proposed BEF is the most suitable location considering bushfire threat, the size of the facility, Asset Protection Zone (APZ) and infrastructure whilst still being able to retain the native vegetation. The largest setbacks are incorporated around the administration building and delivery areas where occupants will be furthest from the fire hazard. The APZ will be managed in perpetuity. The BEF incorporates an essential flare in its design. The flame is permanently contained within an insulated chimney. As chimney is insulated and no open flame and no heat at the surface of the flare, there is little to no risk of fire in adjacent areas and little to no risk to birds that fly over the chimney or attempt to perch upon it. Bird deterrent spikes or equivalent structures could be installed on the horizontal surfaces of the chimney, if it was apparent that birds attempted to perch on the chimney. In the unlikely event this issue came apparent, it would be easily managed through minor engineering of bird deterrents onto the chimney.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(p) disturbance to specialist breeding and foraging	Comb-crested Jacana Other threatened waterbird species.	It is possible that the increased vehicular and foot traffic associated proposed development could cause disturbance to nesting and roosting waterbirds on the wetlands that exist adjacent to the Subject Land.	This impact is localised and not expected to significantly impact upon the bioregional persistence of these species in the bioregion.

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
habitat, e.g. beach nesting for shorebirds.		It is not expected that such impacts will increase significantly above current impacts associated with maintenance and operation of the existing, functional STP. An average of 6-8 truck movements per day (including all deliveries of equipment and materials) are expected during construction of the proposed facility. These movements will primarily be related to delivery of materials and movements on-site for a short-term period. Some light vehicles for construction workers travelling to and from the Site are also expected.	These species are expected to continue to utilise habitat within the Subject Property during and post construction.

5.2.1 Wetland Birds

The Byron Bay STP is also known as 'Byron Wetlands' and is considered a regionally significant habitat for wetland birds. Two stakeholder groups, Byron Bird Buddies and BirdLife Northern Rivers (2021) have dedicated substantial amounts of time and interest in studying and advocating for the conservation and appreciation of wetland birds and their habitat within the Byron Wetlands.

The contributions of these two groups to the understanding of the avifaunal assemblage and community at the Byron Wetlands is significant.

Figure 12. Locations of the constructed wetland cells that provide habitat for wetland birds, and the bird survey transects studied by the Byron Bird Buddies (2010; 2021)

5.3 Prescribed and Uncertain Impacts

This list of impacts includes all of those impacts on biodiversity values not caused by direct vegetation clearing or development that have been prescribed by the *Biodiversity Conservation Regulation 2017*.

Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the BOS, as per clause 6.1 of the BC Regulations. Although the BOS was not triggered for this development BSC is voluntarily undertaking this assessment as part of the BAM. The prescribed impacts (including direct and indirect impacts) are detailed in **Table 19**.

Table 19. Prescribed and Uncertain Impacts.

Will there be impacts on any of the following	Yes/No (If Yes, address all assessment questions from section 6.1 of the BAM in details column)	Details
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No	There are no karst, caves, crevices, cliffs and other features of geological significance on or near the Subject Land.
Habitat of threatened species or ecological communities associated with rocks	No	There is no natural occurrence of rocks in the Subject Land.
Habitat of threatened species or ecological communities associated with human-made structures (e.g. bridges, culverts, abandoned buildings)	No	There are no threatened species or ecological communities located within the Subject Land that can be associated with human made structures.
Habitat of threatened species or ecological communities associated with non-native vegetation	Yes	If human-made structures (e.g. bridges, culverts, abandoned buildings) and non-native vegetation (e.g. camphor laurel trees) provide habitat for threatened species, the assessor must: (a) provide a description of the type of human-made structure or non-native vegetation habitat The proposed development will require the removal of an area of non-native grassland (**Figure 9**), dominated by the tall tussock-forming *Setaria sphacelata*. This grassland provides shelter and prey resources for some threatened fauna species. (b) prepare a list of threatened species that use these features as habitat: • Pale-vented Bush-hen • Dusky Woodswallow • Australasian Bittern • Spotted Harrier • Spotted-tailed Quoll • Black-necked Stork • Brolga • Magpie Goose • White-bellied Sea-Eagle (Foraging) • Little Eagle (Foraging) • Black Bittern • Square-tailed Kite (Foraging) • Barking Owl (Foraging) • Powerful Owl (Foraging) • Eastern Grass Owl • Masked Owl (Foraging) • Sooty Owl (Foraging) • Eastern Chestnut Mouse • Wallum Froglet • Wallum Sedge Frog • Mitchell's Rainforest Snail (c) describe how each threatened species could, or does, use the human-made structure or non-native vegetation as habitat

Will there be impacts on any of the following	Yes/No (If Yes, address all assessment questions from section 6.1 of the BAM in details column)	Details
		Targeted surveys revealed none of the above species within these grasslands, the only species that has been recorded utilising the grasslands is the Mitchell's Rainforest Snail, Wallum Sedge Frog, Wallum Froglet and Pale-vented Bush-hen (historical records). It is considered likely that the threatened birds, mammals and amphibians listed above would all hunt for insect and vertebrate prey in these grasslands on occasion. The Mitchell's Rainforest Snail is likely to shelter, forage and breed within these grasslands, and the Pale-vented Bush-hen and Eastern Chestnut Mouse may roost and nest in the grasslands. It is considered unlikely that any of the other species would breed or nest within these grasslands as the habitat is considered unsuitable for such behaviours among these nomadic fauna species.
Habitat connectivity	No	All areas of habitat connectivity are presented (**Figure 7**). These areas will be protected and unimpacted by the development. The habitat connectivity associated with the Byron Bay Wetlands is significant on a local, state and international level. Local populations of fauna move across these corridors between larger Nature Reserve and National Park estate to the north and south. International populations of migratory birds (e.g. Curlew Sandpiper) utilise the wetlands as 'stepping stones' on their migration routes. The proposed development will not impact upon this habitat connectivity. The development has been specifically designed to fit within an area that has been historically cleared within an existing STP compound surrounded by existing STP infrastructure. Where corridors or other areas of connectivity link habitat for threatened entities, the assessor must: (a) prepare a list of threatened entities that are likely to use or are a part of the connectivity or corridor: All of the ecosystem credit species identified (**Table 11**) and species credit species (**Table 12**) identified as having potential to occur in the Subject Land may utilise the habitat connectivity corridors that the Byron Bay Wetlands in the STP compound form part of. (b) describe the importance of the connectivity to threatened entities, particularly for maintaining movement that is crucial to the species' life cycle
Water bodies, water quality and hydrological processes	Yes	Coastal freshwater wetlands (both natural and artificial) occur within the Subject Property to the south of the Subject Land (**Figure 6**). Where water bodies or any hydrological processes that sustain threatened entities occur on the subject land, the assessor must: (a) prepare a list of threatened entities that may use or depend on water bodies or hydrological processes for all or part of their life cycle, or All of the ecosystem credit species identified (**Table 11**) and species credit species (**Table 12**) identified as having potential to occur in the Subject Land may utilise local waterbodies and hydrological processes for all or part of their life cycle. Swamp Sclerophyll Forest EEC requires natural hydrological regimes (flood events and/or inundation) in order to sustain their existence. The proposed development is not likely to alter the hydrological regimes of the adjacent Swamp Sclerophyll Forest EEC such that a significant effect/impact would ensue.

Will there be impacts on any of the following	Yes/No (If Yes, address all assessment questions from section 6.1 of the BAM in details column)	Details
		(b) prepare a list of threatened entities that will be, or are likely to be impacted by changes to existing water bodies or hydrological processes or the construction of a new water body The proposed development is not likely to significantly change or alter hydrological processes such that a significant effect/impact would ensue upon a threatened species or TEC. (c) describe the habitat provided for each threatened entity by the water body or hydrological process, including consideration of water quality, volume, flow paths and seasonal patterns. The hydrological regimes of importance to the Byron Bay Wetlands and the threatened species and TEC that occur within, are artificial outflows from the STP processing, natural surface water runoff, and groundwater seepage.
Wind farm developments	No	
Vehicle strikes on threatened species of animals or on animals that are part of a TEC	Yes	(a) identify potential impact locations on the Site Map Vehicle strike may occur anywhere in the Subject Land where vehicles move. (c) prepare a list of threatened fauna or animals that are part of a TEC at risk of vehicle strike: • Pale-vented Bush-hen • Dusky Woodswallow • Australasian Bittern • Spotted Harrier • Spotted-tailed Quoll • Black-necked Stork • Brolga • White-bellied Sea-Eagle (Foraging) • Little Eagle (Foraging) • Black Bittern • Square-tailed Kite (Foraging) • Barking Owl (Foraging) • Powerful Owl (Foraging) • Eastern Grass Owl • Masked Owl (Foraging) • Sooty Owl (Foraging) • Eastern Chestnut Mouse • Wallum Froglet • Wallum Sedge Frog • Mitchell's Rainforest Snail • Any other threatened fauna species that may occur on the property from time to time. The proposed access road has been deliberately positioned to access the bioenergy facility through the most disturbed and built-up portion of the property. The access road will be positioned at the western side of the STP infrastructure located away from the settling ponds that are used as wetland bird habitat. There is extensive space between the solar panel array and the STP. This proposed access road location was recommended by BirdLife Northern Rivers (2021). Low speed limits will be enforced from Wallum Place into the STP and BEF. Signage will be installed to warn people to keep below the speed limit to avoid collision with wildlife. Vehicle operators will be notified of the presence of wildlife to reduce chance of collision. There is possibility that birds may collide with the buildings that are erected. This issue arises for any building positioned in an area that birds frequent. Windows pose the greatest collision threat to birds, especially when lights are left on. Windows are not a significant feature in the proposed design, and lights will be turned off when the building is not occupied at night.

6. Avoid and Minimise Impacts

6.1 Alternative Designs Considered

The proposed development footprint has gone through several design revisions since 2019, as shown in Appendix C.

6.1.1 Site Location

There have been a variety of studies and reports prepared over the last eight years that look at the opportunity of bioenergy production in Byron Shire through various technologies and with various siting options. Early consideration for this project began regionally in 2013 through the Sustain Northern Rivers group.

Byron Shire Council in 2017 commissioned a Biomass Sources and Siting Assessment to identify potentially viable biomass streams in Byron Shire, consider preliminary siting options for a Biomass Hub, and initiate community engagement for the development of social license for this project.

The six sites that were deemed potentials were as follows:

- Myocum Transfer Station and quarry;
- Brunswick Valley STP;
- Bangalow STP;
- Ocean Shores STP;
- Tyagarah Council/RMS property; and
- Byron STP.

A comparison made between all the sites is presented (**Table 20**).

BSC commissioned an additional pre-feasibility study in early 2018 to evaluate BEF feedstocks, locations and processing technologies considering Council's objectives and the current bioenergy technology market. The study reviewed three primary bioenergy technology processes, potential Council facility locations and project execution pathways to carry forward to the end goal of a viable BEF.

The Byron Bay STP (BBSTP) and the Brunswick Valley STP (BVSTP) sites were then evaluated and the Byron Bay STP site was identified as the preferred location for the BEF. Principally, the remote location of the BVSTP and its poor access through residential land made it practically impossible for this development, especially when compared to the BBSTP's central Shire location and its existing placement adjacent to the Byron Arts and Industry Estate. A BEF located at the BBSTP would also be beneficial due to a decrease in overall regional transport of biomass waste and is compatible with surrounding land uses.

The Byron Bay STP was the only feasible site for the proposed BEF because of the following attributes and features:

- Central to feedstocks in the Shire.
- Existing public road access.
- Sufficient space available on geotechnically and topographically acceptable land that is not in a flood plain.
- Acceptable Essential Energy grid connection capacity, and sufficient capacity in the on-site transformer and switchboards.
- The BBSTP is the largest electrical user in Council's meters. Supplying the STP electrical demand with 100% renewable energy maximises both: (A) the reduction in GHG emissions (getting close to net-zero carbon emissions) and; (B) the economic value to Council (by replacing grid electricity use).

Prior to commencing the Environmental Impact Statement to seek approval for the facility to be constructed at the BBSTP a Preliminary Environmental Assessment (PEA) and request for Secretary's Environmental Assessment Requirements (SEARs) was prepared. The PEA, completed in March 2020 identified a range of potential constraints, including those associated with the biodiversity values of the neighbouring wetlands, but nothing that would absolutely prevent the proposed development at BBSTP. As a result, BSC chose to proceed with this development application.

As a result of the PEA, detailed ecological assessments were commissioned in the first phase of the EIS (in December 2020) and were used to inform the exact location of the facility within the lot. It was not until December 2020 that some adjacent wetland areas were mapped as having high biodiversity value by the state government, and the biodiversity chapter of the development control plan was updated to include defined setbacks that overlapped with the proposed development footprint. BSC responded to these additional biodiversity constraints by redesign, further investigations by the project's ecologist, and by

confirming state and federal biodiversity related approvals, which all indicated that the development could proceed without significant biodiversity impacts.

Table 20. Comparison made between potential sites for the proposed BEF. Green is best, yellow is possible, red is not feasible.

Factors for Consideration	Bangalow STP	Brunswick Valley STP	Byron Bay STP	Myocum Quarry and Closed Landfill	Ocean Shores	Tyagarah Airstrip
Access via public roads	Must pass through Bangalow town centre	No safe access off Coolamon Scenic Drive; Vallances Road requires considerable safety upgrades	Yes	Myocum Road from Mullumbimby or M1 Ewingsdale Road Interchange	Brunswick Valley Way M1 Interchange	Gulgan Road/Gray's Lane M1 interchange
Available land located outside 100-y. flood plain?	Yes	No / Low	Yes	Not flood plain, but poor prospects for available land for development	Floodplain has ecological values; poor geotech; requires filling	Requires filling, possible closing of airstrip, or land purchase from Crown
Electrical grid tie-in status	Poor	Good	Good	Poor	Poor	Poor
On-site electrical demand	Low	Moderate	High	Very low	Low	Very low
Central to feedstock supplies	Moderate	Poor	Good	Moderate	Moderate	Moderate
On-site feedstocks e.g. biosolids	Insignificant (Biosolids)	~10% of feed (Biosolids)	~20% of feed (Biosolids)	~10% of feed (Garden Organics)	Insignificant (Biosolids)	None
Acceptable?	No	No	Yes	No	No	No
Summary	– Expensive electrical grid tie-in upgrades – Low on-site energy demand – Low fraction of feedstocks on-site	– Unsafe access – Very little flat land available outside 100-yr flood plain – Not central to feedstocks – Less on-site energy demand	– Public roads – Not in flood plain – Electrical grid tie-in available – Largest Council electrical demand – Central to feedstocks – Approx. 20% of facility feed located on-site	– Poor access – Poor prospects for land availability – Poor grid tie-in conditions – Low energy demand – Not central to feedstocks, except GO	– Operating site for foreseeable future – Poor land conditions in flood plain – Poor grid tie-in conditions – Very low energy demand on-site – Not central to feedstocks	– Operating airstrip on-site – Poor land conditions in flood plain – Poor grid tie-in conditions – Very low/no energy demand on-site – No feedstocks generated on-site

6.1.2 Development Footprint

The original development design required the clearing of small patches of native vegetation within the STP lot. However, the design was altered to avoid clearing this vegetation. The retention and protection of all trees surrounding the proposed BEF site has been confirmed by an experienced, qualified Consulting Arborist. As a result, the development will only require the clearing of those weed and exotic grass areas described in **Section 3** of this report. No clearing of native trees is required.

Mitchells Rainforest Snail is the only endangered species that was found during BAM surveys within the development footprint, with an additional four vulnerable species known or predicted to occur. No threatened ecological communities occur within the development footprint. There will be no loss of any extent of threatened ecological community because of the proposed development.

To provide certainty that the impacts on the Mitchells Rainforest Snail will not be considered significant under the Environment Protection and Biodiversity Conservation Act 1999, Byron Shire Council submitted a referral to the Commonwealth Department of Agriculture, Water and the Environment on 7 June 2021, as described below.

6.1.3 Vehicular Access

An alternative dedicated truck access road was previously considered along the eastern boundary of the Byron STP lot to connect Wallum Place with Ewingsdale Road near the entrance to the Cavanbah Centre. However, this route would have required significant clearing of vegetation and construction in areas of high biodiversity value coastal wetlands and would therefore result in greater overall environmental impact than using Bayshore Drive and Wallum Place for truck access. This option was excluded from the proposal and replaced with a proposed access to the east of the STP adjacent to the constructed wetlands along an existing gravel access track.

Post exhibition of the EIS, access has been refined further to reduce potential impacts to fauna using the constructed wetlands for habitat to the east of the Proposed BEF. The access road has now been relocated and placed to the north on an existing gravel road internal to the existing STP. This was one of the recommendations of the submission by BirdLife Northern Rivers (2021).

The new BEF access road is situated upon an existing paved alignment which will require minor clearing even of mixed widely cultivated native and exotic grasses. Use of this access route does not require clearing of any remnant or important native vegetation and will reduce the potential impact of any vehicle movement or noise disturbance on fauna using the constructed STP wetlands.

6.2 Impact Mitigation and Minimisation Measures

This section of the report details recommended efforts to avoid and minimise impact on biodiversity values associated with the proposed development. Measures to be implemented before, during and post construction to avoid and minimise the impacts of the project are detailed in (**Table 21**). The final project footprint including construction and operation is presented as the 'Subject Land' in **Figure 1**.

It is unlikely there will be any appreciable indirect impacts on biodiversity arising from the proposal that have not been addressed in **Table 21** below, especially when considering the nature and scale of the proposed development; the character of the study area; the historic disturbance and fragmentation, and maintenance of vegetation within the Subject Property in conjunction with the proposed impact mitigation measures. Only the direct impacts associated with vegetation clearing and construction of the proposed development typically require biodiversity offsets according to the BAM. However, as this BDASR is the result of Councils decision to opt-in to the BOS, there are no Biodiversity Offset Credit obligations required for the proposed development (see **Section 8**).

The location of the project next to an operation Sewage Treatment Plant, within historically cleared and managed land (i.e. lawn and non-native grassland) is the most optimal location within the property and locality for this type of project.

Table 21. Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project

Impact / Action	Outcome	Timing
Project Location and Project Design	The development is located entirely within an area of land that has been historically cleared of native vegetation. This area of land occurs within the compound of an existing, functional STP. The development has been designed specifically to avoid direct impacts to remnant native vegetation and habitat connectivity. An experienced Consulting Arborist has assessed all of the trees around the proposed development and confirmed that all trees can be protected and retained (Northern Tree Care 2021). There will be sufficient space for ancillary structures (e.g. site compounds and laydown areas) during construction to avoid impacts to remnant native vegetation and habitat connectivity. Important fauna habitats such as remnant vegetation and wetlands have been avoided through the design process.	Pre-construction
Preparation of a Construction Environmental Management Plan (CEMP)	A Construction Environmental Management Plan (CEMP) will be prepared for the construction phase of the project prior to issue of the Construction Certificate. The CEMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the procedures outlined below. A soil and water management plan has been produced (MPC 2021). The proposed mitigation measures will include environmental safeguards for protection of neighbouring properties and nearby waterways hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas in accordance with relevant policy documentation and Government guidelines. In order to address the potential impacts of the proposal on biodiversity, the mitigation and management measures outlined within this table will be implemented as part of the CEMP for the site.	Pre-construction
Mitchell's Rainforest Snail Salvage Relocation Protocol and Management Plan	A site-specific 'Mitchell's Rainforest Snail Salvage Relocation Protocol and Management Plan' will be produced which guides the implementation of impact mitigation measures designed to protect the Mitchell's Rainforest Snail.	Pre-construction During construction Operational phase
Tree Protections	The proponent will engage a qualified Arborist to establish tree protections zones around retained native trees surrounding the development site as per the Australian Standards (AS 4970-2009 Protection of trees on development sites) before any construction or clearing commences to reduce risk of impacts to trees from the construction activity.	Pre-construction During construction
Hygiene Protocol	A hygiene protocol will be produced as part of the CEMP. The Hygiene protocol for the control of diseases in Australian frogs (Murra et al. 2011) will be made available on-site and adhered to. All persons accessing site will be informed of the hygiene protocols and, in particular the sensitivity of the threatened frog species in the Subject Property. Where required, trucks will be washed out in the receival hall before collection of compost for dispatch to customers or transfer to Myocum. Leachate and wash down water generated in the receival hall will be contained in the hall by bunding, collected in the receival hall pump sump, and reused in the process. By design, the Receival Hall does not drain to the external stormwater sump. Leachate (also known as percolate) from both aerobic and anaerobic processes is stored in the percolate tank (600 m3 capacity). The process is designed for zero liquid discharge, however, in the unlikely event that excess leachate is generated by the process, it will be pumped out from the percolate storge tank and treated at a suitably licensed facility. The wheel wash and rumble grid will be located on the access road between the weighbridge and the entrance off Wallum Place. Wheel wash systems are designed recirculate and filter wash water. Where excess wheel wash water accumulates, it will be pumped out and treated at a suitably licensed facility.	Pre-construction During construction Operational phase
Clearing of Vegetation and Fauna Habitat	In preparation for the authorised clearing of native vegetation, the following conditions will be adhered to in order avoid and to minimise all potential impacts to native biodiversity values within the Subject Land. Before any vegetation is damaged or removed, a qualified Ecologist will be assigned to undertake a pre-clearing survey to help a Surveyor delineate areas permitted to be cleared from areas that must be retained. Brightly coloured bunting or strong flagging tape should be used to delineate clearing and construction areas, from areas to be retained ('no go zones').	Pre-construction During construction

Impact / Action	Outcome	Timing
	Prior to vegetation being damaged or removed, a qualified Ecologist with fauna identification experience will determine the presence of any suitable habitat for roosting microbats, nesting birds or other fauna in the area of the Subject Land due to be cleared. A qualified Project Ecologist with experience in handling wildlife will be present on the site hollow-bearing tree clearing in order to supervise clearing and salvage and relocate any displaced, healthy animals, or care for/ rehabilitate any injured or orphaned animals. Pest species will be humanely euthanised.	
Dewatering of Dams	NA	NA
Nest box / Artificial Hollow Installation	NA	NA
Salvage and Relocation of Bush Rock and Woody Debris	NA	NA
Landscaping	It is proposed that landscaping to be undertaken within the Subject Land use only flora species representative of locally indigenous vegetation community Swamp Sclerophyll Forest EEC, as approved by an Ecologist. No non-native/exotic plants or native cultivars will be utilised in the Landscape design.	Pre-construction During construction
Erosion and Sedimentation During Construction	Appropriate erosion and sediment control will be erected and maintained during construction in order to avoid the potential of incurring indirect impacts on biodiversity values. As a minimum, such measures will comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004). On-going erosion and sedimentation risks will be mitigated through implementation of the recommendations made by the Project Engineers.	Construction phase
Erection of Temporary Construction Fencing	Temporary fencing will be erected around the construction site so as to ensure no inadvertent clearing of native vegetation or habitat that is not approved to be cleared. This will also ensure machinery and vehicles do not enter sensitive areas outside of the development footprint.	Pre-construction During construction
Permanent roads and driveways	The following impact mitigation controls are proposed in accordance with Byron Council DCP (B1.2.2) The development will incorporate friendly road design such as; speed limits, traffic calming, signage, exclusion fencing and fauna crossing structures (under passes, overpasses etc.) wherever considered necessary by Council. Where on-going impacts to wildlife are likely, the road design is to incorporate best practice fauna sensitive design features to facilitate unimpeded wildlife movement as well as minimising any other ongoing impacts on biodiversity values, paying particular attention to the requirements of any threatened fauna or other significant fauna. Such design features will be monitored and maintained to minimise impacts on wildlife such as Mitchell's Rainforest Snail. During road construction and upgrading, appropriate environmental safeguards are to be employed to avoid and minimise any biodiversity impacts. Fauna friendly road design structures shall be maintained by the proponent for a minimum period of five years after road dedication unless otherwise agreed by Council. Where a vegetation or biodiversity conservation management plan is required, any measures or related conditions of consent to mitigate road impacts on biodiversity shall be incorporated into the management plan and implemented accordingly.	Pre-construction During construction Operational phase
Permanent Fencing	The following impact mitigation controls are proposed in accordance with Byron Council DCP (B1.2.2). Fauna exclusion fencing (or other measures) will be installed in order to reduce a significant fauna mortality risk as a result of crossing from one area of suitable habitat to another. Fauna exclusion fencing will be constructed and operational prior to the physical commencement of works (including clearing vegetation, the use of heavy equipment for the purpose of breaking ground for bulk earthworks, or infrastructure for the proposed development). Fencing design will include suitable clearances to maintain functionality and allow for access for replacement and routine maintenance. All exclusion fencing, fauna friendly fencing or other structures designed to protect fauna will be monitored and maintained to minimise impacts on wildlife. Part of the fencing installed near the BEF will incorporate local provenance native flora species (i.e. native vines) to reduce aesthetic impacts of the BEF and promote habitat for birds, frogs and Mitchells Rainforest Snail.	Pre-construction During construction Operational phase

Impact / Action	Outcome	Timing
Storage, Stockpiling and Importing Soil and Materials	All storage, stockpile and laydown sites will be located away from any native vegetation to be retained. Importing soil from outside the site can introduce weeds and pathogens to the site and has the potential to incur indirect impacts on biodiversity values. Only certified clean soil, gravel, rock and building materials will be imported to the site.	Pre-construction During construction Operational phase
Stormwater and Wastewater	Sanitary wastewater will be discharged to the adjacent STP. Process liquid waste will be retained in a dedicated storage tank with the facility and reused in the process. Stormwater will be retained in an underground tank before being filtered and discharged at flow rates not exceeding pre-development flows	Pre-construction During construction Operational phase
Mitigating effects of Noise and Lighting	Lighting (or similar high intensity outdoor lighting) will be designed to avoid light spill into natural areas. Lighting will be turned-off at night when the site is not occupied. Noise during construction will be minimised and limited to permitted working hours. Vehicle noise will be managed by enforcing slow speed limits, avoiding break noise, and ensuring the tipping of materials occurs in an enclosed area (in-doors).	Pre-construction During construction Operational phase
Pest animals	Development has been designed to minimise the likelihood of pest animal establishment/proliferation. Areas will be regularly monitored and managed to contain and adequately control pest animal populations.	Pre-construction During construction Operational phase
Pest plants	The construction and future usage of the development will be undertaken in a manner that minimises the establishment/proliferation of pest plant species (weeds) declared under the Biosecurity Act 2015, and where present, include measures to control them. All landscaping and landscape design will be consistent with DCP 2014 Chapter B9 Landscaping. Where a vegetation or biodiversity conservation management plan is required, any measures or related conditions of consent to manage pest plants shall be incorporated into the management plan and implemented accordingly.	Pre-construction During construction Operational phase
Mitigating effects of Construction Noise	All noise will be limited to the timeframes allowed by law. If Council is notified of any breeding by threatened bird species near the development site (e.g. Comb-crested Jacana at H-cell) Council will engage a suitably qualified person to advise the best course of action to reduce potential for indirect impacts.	Pre-construction During construction Operational phase

7. Other Relevant Legislation, Plan & Policies Requiring Address

7.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

A referral to the Commonwealth has been prepared and submitted by the proponent to assess impacts of the development upon any occurring Matters of National Environmental Significance (MNES), such as Mitchell's Rainforest Snail.

It is not expected that any threatened species or ecological communities listed under the EPBC Act will be significantly impacted to facilitate this development.

7.2 State Environmental Planning Policy (Koala Habitat Protection) 2021

Byron Coast Comprehensive Koala Plan of Management (CKPOM) (Byron Shire Council 2015) requires a 'Standard Koala Habitat Assessment Report' to meet the requirements of 12.2.2 of the CKPOM. This document must accompany the proposed DA. The proponent is preparing a Standard Koala Habitat Assessment Report to accompany the DA.

7.3 Water Management Act 2000

The proposed development is not located within 40 metres of a watercourse or waterbody mapped on a 1:25,000 scale topographic map, therefore the *Water Management Act 2000* does not apply.

7.4 NSW Fisheries Management Act 1994

The proposed development will not impact upon any habitat for threatened fish as listed under the *NSW Fisheries Management Act 1994*, neither will the development impact upon any Key Fish Habitat.

The nearest proximal Key Fish Habitat is associated with the Brunswick River. The proposed development will not directly impact upon this Key Fish Habitat.

7.5 National Parks and Wildlife Act 1974

The proposed development is located on a land parcel that sits adjacent to Tyagarah Nature Reserve which is managed by the NSW National Parks and Wildlife Service.

The development will be undertaken in accordance with the publication, "*Developments adjacent to National Parks and Wildlife Service lands Guidelines for consent and planning authorities*" (NSW NPWS 2020). These guidelines have been prepared for use by councils and other planning authorities when they assess development applications that may impact on land and water bodies.

Councils and other consent authorities need to consider the following issues when assessing proposals adjacent to NPWS land and, in particular, their impacts on the park, its values and NPWS management of the park:

- erosion and sediment control
- stormwater runoff
- wastewater
- management implications relating to pests, weeds and edge effects
- fire and the location of asset protection zones
- boundary encroachments and access through NPWS lands
- visual, odour, noise, vibration, air quality and amenity impacts
- threats to ecological connectivity and groundwater-dependent ecosystems
- cultural heritage
- road network design and its implications for continued access to the park

For each of these issues, the guidelines identify the key risks to NPWS land and a recommended approach for consideration by planning authorities.

Table 22. Issues to be considered when assessing proposals adjacent to NPWS Parks

Issue	Assessment of Impacts	Mitigation Measures
Erosion and sediment control	The proposed development is separated from Tyagarah Nature Reserve by the existing STP compound. No watercourses flow through the Subject Land. Erosion and sediment controls will prevent erosion and sedimentation moving into the catchments flowing into Tyagarah Nature Reserve.	Erosion and sediment controls will be implemented in accordance with best practice: • clearance of native vegetation will be kept to a minimum • areas of retained vegetation will be fenced off during construction • areas of bare soil and stockpiles will be managed to prevent erosion during the construction process • disturbed areas will be rehabilitated and appropriately stabilised as soon as possible following construction (this includes removal of control measures, such as sediment fences, when they are no longer required). To prevent sediment moving from an adjacent property onto NPWS land, and to avoid and minimise erosion risks, NPWS also recommends that appropriate controls should be applied in accordance with the following guidance documents: • Erosion and sediment control on unsealed roads (OEH 2012)6 • Managing Urban Stormwater – Soils and Construction, Volume I (Landcom 2004)7 • Managing Urban Stormwater – Soils and Construction, Volume II (DECC 2008)8 • A Resource Guide for Local Councils: Erosion and Sediment Control (DEC 2006)
Stormwater runoff	The proposed development is separated from Tyagarah Nature Reserve by the existing STP compound. No discharge of stormwater into NPWS land will take place. No watercourses flow through the Subject Land. The development is located on topographically higher land within the catchment. No natural flows will be significantly impacted by the development. Stormwater management infrastructure has been designed into the development proposal (SHAC 2021) in a manner that will prevent dispersal of litter and pests (especially weeds), altered nutrient composition, and risk of erosion and sedimentation. The proposed development design will prevent flow of stormwater runoff into the adjacent SEPP (Coastal Management) 2018 Coastal Wetlands.	Stormwater will be implemented in accordance with best practice: • The development proposal incorporates stormwater detention and water quality systems (with appropriately managed buffer areas) within the development site. • Water sensitive urban design (WSUD) principles have been applied • Stormwater will be diverted to systems within the development site. • The applicant will ensure that all tanks, storage areas and associated infrastructure are appropriately sized and maintained to ensure that there is no unauthorised overflow onto NPWS land.
Wastewater	The proposed development is separated from Tyagarah Nature Reserve by the existing STP compound. The proposed development is located in an existing, state of the art, waste treatment facility. The development is centred on safe, extraction and utilisation of wastes.	The applicant will design, construct and operate disposal systems to the highest standards. Incorporating compliance measures that will be used to ensure ongoing satisfactory operation of the systems.

Issue	Assessment of Impacts	Mitigation Measures
	No wastewater will be discharged into the NPWS Estate.	
Pests, weeds and edge effects	The proposed development is separated from Tyagarah Nature Reserve by the existing STP compound, which is a secure, gated facility. Access into Tyagarah Nature Reserve from the STP is off limits. The proposed development will not: • lead to increased impacts from invasive species (weeds and pests), domestic pets and stock • facilitate unmanaged visitation, including informal tracks, resulting in negative impacts on cultural or natural heritage values, or • lead to impacts associated with changes to the nature of the vegetation surrounding the park. • impede NPWS access for management purposes	An appropriate buffer currently exists between the proposed development and NPWS land. During construction works adjoining parks, the boundary of the NPWS park and any buffer will be demarcated using a visually obvious barrier such as temporary fencing or flicker tape to reduce the risk of accidental encroachments.
Fire and the location of asset protection zones	The proposed development is located within a facility that is already managed of fire hazard. Potential impacts have been assessed in a separate Bushfire Risk Assessment (Bushfire Risk 2021). This BRA details proposed mitigation measures.	Continue to manage the existing STP compound to reduce fire hazard as present.
Boundary encroachments and access through NPWS land	No pre-construction, construction or post-construction activity will occur on land managed by NPWS. Any access that does occur must be legally authorised and comply with park management objectives.	NPWS land will not to be used: • to access development sites • to store materials, equipment, workers' vehicles or machinery • for maintenance access after development.
Visual, odour, noise, vibration, air quality and amenity impacts	The proposed development has been designed to minimise operational noise, vibration, air quality and amenity.	• Any landscaping will be comprised of local native plant species • Hours of operation will be limited to between 7am and 5pm • Light shine into NPWS from street or security lighting will be minimised.
Threats to ecological connectivity and groundwater-dependent ecosystems	The proposed development has been deliberately positioned in a location that will avoid impacts to ecological connectivity and groundwater dependent ecosystems.	• Vegetation, waterways and water bodies close to NPWS land that exhibit ecological connectivity will be retained and protected.

7.6 Byron Shire Development Control Plan 2014

The Byron Shire Development Control Plan 2014 (DCP) is a detailed planning document which provides extensive controls for developments across Byron Shire. General planning requirements are addressed in the Environmental Impact Statement (EIS) for the project.

This section details the DCP controls relating to biodiversity and how they will be met in facilitating the proposed development (**Table 23**).

Table 23. Development Controls Relating to Biodiversity

Control	How Addressed
Ecologically Sustainable Development (P1) The principles of Ecologically Sustainable Development will be followed in the exercise of Council responsibilities: a. The precautionary principle If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: (a) careful evaluation to avoid, wherever practicable, serious or irreversible damage, and (b) a rigorous and science-based assessment of the risk – weighted consequences of various options; b. Inter-generational equity requires the present generation to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. c. The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making, including in the formulation, adoption and implementation of any economic and other development plan, program or project. Biological diversity means the diversity of life and comprises: i. Genetic diversity (the variety of genes in a population) ii. Species diversity (the variety of species) iii. Ecosystem diversity (the variety of communities and ecosystems). d. Improved valuation, pricing and incentive mechanisms Environmental factors should be included in the valuation of assets and services such as; (a) the polluter pays principle, where those who generate pollution and waste should bear the costs of containment, avoidance or abatement, (b) the user of goods and services should pay prices based on the full life cycle of the costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (c) environmental goals, having been established, should be pursued in the most cost effective way.	The proposed development is a unique example of outstanding Ecological Sustainable Development through repurposing waste products to create power for the local community. This will save on landfill, processing and the burning of fossil fuels for power generation. The proposed development has been actively designed and located away from existing stands of forest. Arborists will be engaged to oversee design and construction to ensure no indirect impact to native trees surrounding the development. By conserving all remnant vegetation surrounding the development, optimal biodiversity conservation is obtained.

Control	How Addressed
Consistency with overarching biodiversity strategies (P2) Council's decision making should be consistent with, and contribute to, targets set out in any relevant adopted local, regional, NSW State or National strategy that addresses the conservation and/or management of biodiversity (e.g. NSW Biodiversity Conservation Investment Strategy 2018).	This BDAR follows the BAM 2020 which underpins the NSW Biodiversity Conservation Investment Strategy 2018.
No net loss (P3) The carrying out of development should maintain or improve biodiversity outcomes wherever possible within Byron Shire.	The proposed development has been designed in accordance with the principles of avoid, minimise and offset as required under the BAM.
Climate change (P4) Development should not compromise or impact the ability of any native flora and fauna species to respond to the impacts of climatic change.	The proposed development will help reduce the effects of climate change by helping Byron Shire Council become Carbon Neutral.
In situ conservation (P5) Biodiversity is best conserved in situ (on site). The prevention of habitat loss and degradation is the first priority. This is significantly more cost-effective and has less risk than providing for ongoing mitigation or the reconstruction of habitat in another area (i.e. offsetting biodiversity). This further supports climate change adaptation through increasing the resilience of natural areas.	The proposed development has been designed to avoid impacts to adjacent forest and wetland vegetation. No direct loss of remnant vegetation will take place. The maximum level of biodiversity will be retained.
Habitat fragmentation and connectivity (P6) Council decision-making should not contribute to habitat fragmentation and wherever possible, increase landscape connectivity. Natural areas are strongly influenced by the landscape in which they are embedded. The larger, less disturbed and better-connected natural areas are, the more likely they are to retain a higher level of biodiversity and resilience to impacts.	The proposed development has been designed in consultation with Council in a manner that avoids fragmentation and protects habitat connectivity. Wetland vegetation 'stepping-stones' and connective habitat links will be maintained during and post development.
Small remnants (P7) Small patches of habitat should be retained where possible and measures taken to mitigate edge effects and other relevant threats. Small, isolated patches of habitat are often vulnerable to edge effects and other threats from the adjacent landscape. However, such areas often support a wide range of native species (including threatened species), represent communities of 'over-cleared' vegetation while providing refugia and /or stepping stones across the landscape for flora and fauna. Such refugia found in small remnants may be crucially important to the survival of certain species into the future under changing climate conditions.	The proposed development has been designed and positioned to avoid and minimise impacts to all small native vegetation remnants that surround the STP compound.
Disturbed habitats (P8) Where possible, measures should be taken to retain and restore disturbed habitats. There are few natural areas that remain free of disturbance or threatening processes. Disturbed habitats represent opportunities for natural regeneration, restoration and enhancement, increasing ecological resilience, while playing an important role in protecting native flora and fauna and in many instances, threatened species.	Disturbed areas surrounding the proposed development will continue to be restored as part of Byron Shires commitment to on-going habitat restoration and conservation (Byron Shire Council 2020). The proponent has opted to landscape areas surrounding the BEF with locally indigenous flora to enhance habitat values for wildlife, including birds, frogs and Mitchell's Rainforest Snail.
Patch diversity (P9) Measures should be taken to conserve biodiversity at patch scale. Patches of bushland or other natural areas (e.g. wetlands) containing multiple vegetation communities commonly support high species diversity in conjunction with ecosystem diversity.	Native vegetation patch diversity in the locality will be retained during and post development. The development has been designed specifically to achieve this aim.
Fauna habitat (P10) Key fauna habitat resources should be retained and where possible enhanced. Many native fauna including threatened species have specific resource requirements (e.g.	All fauna habitat resource types which currently exist in the locality will continue to exist post development. The most important of these fauna habitats are the remnant woodland and wetland habitats.

Control	How Addressed
feeding, nesting, and roosting) for their continued survival. Also, most native animals are not confined to a single ecological community and make use of resources across a range of different habitats. As ranges change, resource use has, and will continue to evolve across urban and other developed land.	
Watercourses (P11) Natural watercourses and the riparian land adjoining them should be retained and rehabilitated where possible. These areas provide critical resources and refuge during extreme weather events particularly during drought and or fire.	No natural watercourses occur in proximity to the development.
Under reserved and over-cleared vegetation communities (P12) Ecological communities that have been over-cleared or under-reserved in the formal reserve system (e.g. National Parks and Nature Reserves) should be retained and where possible enhanced. Many vegetation communities have been disproportionately cleared since European settlement or are poorly reserved in the formal reserve system. Their long-term future will depend on their conservation on private land e.g. Saline Wetlands. (see Far North Coast Regional Conservation Plan pg. 26)	All native vegetation communities will be retained and protected, during and post development. There will be no clearing of remnant native vegetation.
Avoid and minimise (P13) Priority should be given to avoid any impacts at their source. In this context 'avoid' means "to keep away from". Evidence of avoidance may be illustrated through the use of ecological buffers, the design of a development footprint, or by regulating the timing or location of activities. If it is not possible to avoid impacts, then opportunities should be sought to minimise the impacts. Minimise means "reduce to the smallest possible amount or degree".	The development footprint was redesigned from earlier prototype to actively avoid direct impacts to all remnant native vegetation in the STP property (see **Section 6**).
Biodiversity offsets and compensation (P14) Subject to P13, where avoidance and minimisation have been clearly considered and illustrated, unavoidable residual impacts arising from development may be allowable. In such instances, an acceptable arrangement to compensate for, or offset the loss of biodiversity values should only occur on or near the impact site.	No remnant vegetation will be impacted for the proposed development to take place, however, this BDAR proposes measures that will help offset residual impacts to threatened species habitat.
Habitat heterogeneity (P15) Ecological mapping and assessments should recognise that there can be considerable local variation within and between habitats belonging to individual ecological communities described at regional scales. Ecological communities are commonly described regionally in general terms but are characterised at specific sites by local variations. Individual site-specific responses to environmental and climatic conditions, disturbance regimes and cumulative impacts and location may all contribute to these distinctions.	The proposed development will clear a weed-infested, managed (mowed) native grassland (lawn) which provides low habitat heterogeneity. No other habitat will be impacted by the development.
Indirect and cumulative impacts (P16) Ongoing pressures on biodiversity arising from indirect and/or cumulative impacts of development must be understood, minimised and effectively mitigated.	The proposed development is situated in a position adjacent to existing industrial infrastructure. No important native vegetation or habitat will be removed. The development will not contribute to cumulative impacts. The proposed development has been designed and will be facilitated in a manner that minimises and manages all potential indirect impacts to fauna or flora.
Habitat restoration and management (P17) As much of Byron Shire contains fragmented landscapes, it is not sufficient to simply prevent direct habitat loss. Retained habitats associated with development should be actively managed (through a management plan or other mechanism) to prevent the ongoing degradation of biodiversity values and will contribute to climate adaptation.	Disturbed areas surrounding the proposed development will continue to be restored as part of Byron Shires commitment to on-going habitat restoration and conservation (Byron Shire Council 2020).

Control	How Addressed
Ecological setback (P18) Developments adjoining natural areas are to provide for an effective ecological setback to avoid and minimise adverse impacts on biodiversity values. Objectives 1. To identify ecologically significant areas (red flags) with the potential to influence the shape and form of a proposed development envelope. 2. To ensure areas that areas to be retained are adequately protected and or managed to guarantee their long-term ecological viability. 3. To ensure 'no net loss of biodiversity' through the principles of avoiding and minimising development impacts.	The proposed development has been designed in a manner that is consistent with the Objectives of P18 and B1.2.1. The development envelope has been shaped and positioned to avoid directly impacting upon any ecologically significant area. No area of important wetland or threatened ecological community will be directly impact by the development. This will ensure 'no net loss of biodiversity' through the principles of avoiding and minimising development impacts. The development is positioned within the 'Ecological Setback' area of an 'Important Wetland' (Coastal Management SEPP Wetland) and a 'Threatened Ecological Community' (Swamp Sclerophyll Forest EEC) (**Figure 9**). However, it is important to note that the 'biodiversity' located in this 'Ecological Setback' area consists entirely of mown, manicured derived exotic and native grassland monocultures. The native grassland consists of widely cultivated species among weeds, and holds little biodiversity significance. Effort has been taken to ensure that the development does not significantly impact upon the important ecological features that the setbacks were established to protect. Impacts to the important wetland are discussed in **section 2.3.**3 and impact mitigation measures are detailed in **section 6.** Impacts to the Swamp Sclerophyll Forest EEC are discussed in **section 3.4, section 5.1.1** and impact mitigation measures are detailed in **section 6.** The proposed development will not significantly impact upon any ecologically significant areas (red flags) to which the Ecological Setback DCP has been established to protect. The development has been designed and will be managed to ensure areas that areas to be retained are adequately protected and or managed to guarantee their long-term ecological viability.
Bushfire (P19) Measures to mitigate bushfire risk should take into account the natural fire regimes essential for supporting the relevant ecological community(s) and avoid negative impacts on biodiversity.	The proposed development has been assessed of bushfire risk and impact mitigation measures proposed, including a small APZ which will not require any additional clearing of trees or other vegetation (Bushfire Risk 2021).
Weeds and cultivated plantings (P20) Development adjacent to natural areas should avoid the use of non-indigenous plants or have measures in place (such as slashed bushfire asset protection zones) to limit their dispersal into natural areas.	The proposed developments will not utilise any non-indigenous plants in any future landscaping. Landscaping (if any) will only incorporate locally indigenous flora.
Introduced animals (P21)	The development will not cause the introduction of any animals beyond those already present in the Subject Property.

Control	How Addressed
Development should not cause or exacerbate adverse impacts on biodiversity from the introduction of animals	
Fauna protection (P22) Where appropriate, developments should integrate measures to protect and facilitate native fauna occupancy and movement (such as the suitable design of swimming pools, fences, landscaping, road crossings, nature strips and nest structures etc.).	Fauna protections are discussed in this report (see **section 6.2**).
Construction impacts (P23) Where appropriate, measures to ensure any impacts on biodiversity and other natural resources are effectively mitigated throughout the construction phase of the development.	A detailed suite of impact mitigation measures is provided (see **section 6.2**).
Ecological assessment (P24) The assessment of biodiversity values should address site, landscape and regional values in accordance with contemporary best practice.	This BDAR has been produced to address site, landscape and regional biodiversity values in accordance with NSW best practice, the BAM.
Costs of ongoing management (P25) In accordance with the principles of Ecologically Sustainable Development (see P1) the proponent or development should bear the costs of managing ongoing pressures placed on biodiversity values as a result of development.	The proponent has allocated costs into redesign to avoid biodiversity impacts from remnant vegetation clearing. Residual impacts will be funded through allocation of funding to retire biodiversity offset credits. Costs of appropriate on-going management of the site are included in the Bioenergy Facility Operations and Management budgets, and otherwise form a normal part of Council's Infrastructure Services Utilities and Open-Spaces Departments.

8. Biodiversity Offset Credit Requirements

The impacts of the development are unlikely to significantly affect threatened species, ecological communities or their habitats. The biodiversity impacts of the development do not trigger entry into the BOS, however, Council has opted into the BOS. Council, as the proponent, can voluntarily lodge a BDAR to assist with the evaluation of this DA, however, a voluntarily lodged DA does not give Council the power to impose a biodiversity offset credit retirement obligation as a condition of consent to a DA where the BOS was opted in (**Appendix F**).

This BDAR is the result of Councils decision to exercise best-practice and opt into the BOS.

Council does not impose any retiring of biodiversity offset credits, but instead will agree to granting the funding of a suite of biodiversity conservation actions in the 'Byron Wetlands' property. Council will consult with local environmental groups on the construction of targeted conservation actions for example:

- The installation of artificial nesting structures to encourage breeding by threatened avifauna
- Sourcing local provenance bird attracting flora for installation in a 'living fence' near the proposed development footprint.

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10. Appendices

Appendix A. Fauna recorded on Subject Land during Site Assessments by Land Eco Consulting in January, February and March 2021

Appendix B. BAM VIS Field Survey Forms (copied from electronic data sheet)

Appendix C. Biodiversity Credit Reports from Biodiversity Assessment Method Calculator

Appendix D. Species Polygons for Species Credits

Appendix A. Fauna recorded within and adjacent the Subject Land during Site Assessments by Land Eco Consulting in January, February and March 2021. Note, few of these species were physically recorded within the Subject Land itself.

Class	Scientific Name	Species	Status BC Act	Where observed
Aves	*Acanthiza pusilla*	Brown Thornbill	Protected	In remnant trees adjacent Subject Land
Aves	*Alectura lathami*	Australian Brush Turkey	Protected	Under remnant trees adjacent Subject Land
Aves	*Anas superciliosa*	Pacific Black Duck	Protected	In wetland adjacent Subject Land. Foraging in Subject Land during wet conditions.
Aves	*Anthochaera chrysoptera*	Little Wattlebird	Protected	In remnant trees adjacent Subject Land
Aves	*Artamus leucorynchus*	White-breasted Woodswallow	Protected	Perched on STP buildings. Flying-over Subject Land.
Aves	*Aythya australis*	Hardhead	Protected	In wetland adjacent Subject Land.
Aves	*Bubulcus ibis*	Cattle Egret	Protected	Perched on STP buildings. Flying-over Subject Land.
Aves	*Cacatua sanguinea*	Little Corella	Protected	Perched on STP buildings. Flying-over Subject Land
Aves	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	Protected	In remnant trees adjacent Subject Land
Aves	*Cacomantis variolosus*	Brush Cuckoo	Protected	In remnant trees adjacent Subject Land
Aves	*Chrysococcyx basalis*	Horsfields Bronze Cuckoo	Protected	In remnant trees adjacent Subject Land
Aves	*Chrysococcyx lucidus*	Shining Bronze Cuckoo	Protected	In remnant trees adjacent Subject Land
Aves	*Cisticola exilis*	Golden-headed Cisticola	Protected	Within and adjacent to Subject Land
Aves	*Colluricincla harmonica*	Grey Shrike-thrush	Protected	In remnant trees adjacent Subject Land
Aves	*Colluricincla megarhyncha*	Little Shrike-thrush	Protected	In remnant trees adjacent Subject Land
Aves	*Columba leucomela*	White-headed Pigeon	Protected	In remnant trees adjacent Subject Land
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	Protected	In remnant trees adjacent Subject Land
Aves	*Corvus orru*	Torresian Crow	Protected	Within and adjacent to Subject Land
Aves	*Cracticus tibicen*	Australian Magpie	Protected	Within and adjacent to Subject Land
Aves	*Cracticus torquatus*	Grey Butcherbird	Protected	Within and adjacent to Subject Land
Aves	*Cygnus atratus*	Black Swan	Protected	In remnant trees adjacent Subject Land
Aves	*Dacelo novaehollandiae*	Laughing Kookaburra	Protected	In remnant trees adjacent Subject Land
Aves	*Dendrocygna arcuata*	Wandering Whistling Duck	Protected	In remnant trees adjacent Subject Land
Aves	*Dicaeum hirundinaceum*	Mistletoebird	Protected	In remnant trees adjacent Subject Land
Aves	*Dicrurus bracteatus*	Spangled Drongo	Protected	In remnant trees adjacent Subject Land
Aves	*Egretta novaehollandiae*	White-faced Heron	Protected	Within and adjacent to Subject Land
Aves	*Elseyornis melanops*	Black-fronted Dotterel	Protected	Within and adjacent to Subject Land
Aves	*Entomyzon cyanotis*	Blue-faced Honeyeater	Protected	In remnant trees adjacent Subject Land
Aves	*Eopsaltria australis*	Eastern Yellow Robin	Protected	In remnant trees adjacent Subject Land
Aves	*Gallinula tenebrosa*	Dusky Moorhen	Protected	In wetland adjacent Subject Land
Aves	*Geopelia humeralis*	Bar-shouldered Dove	Protected	In remnant trees adjacent Subject Land
Aves	*Gerygone olivacea*	White-throated Gerygone	Protected	In remnant trees adjacent Subject Land
Aves	*Glossopsitta concinna*	Musk Lorikeet	Protected	In remnant trees adjacent Subject Land
Aves	*Grallina cyanoleuca*	Magpie-lark	Protected	In remnant trees adjacent Subject Land
Aves	*Haliaeetus leucogaster*	White-bellied Sea Eagle	Vulnerable	Flying over Subject Land

Class	Scientific Name	Species	Status BC Act	Where observed
Aves	*Hirundapus caudacutus*	White-throated Needletail	Protected	Flying over Subject Land
Aves	*Hirundo neoxena*	Welcome Swallow	Protected	Perched on STP buildings. Flying-over Subject Land.
Aves	*Lalage leucomela*	Varied Triller	Protected	In remnant trees adjacent Subject Land
Aves	*Lichmera indistincta*	Brown Honeyeater	Protected	In remnant trees adjacent Subject Land
Aves	*Malurus cyaneus*	Superb Fairywren	Protected	In remnant trees adjacent Subject Land
Aves	*Manorina melanocephala*	Noisy Miner	Key Threatening Process	In remnant trees adjacent Subject Land
Aves	*Megalurus gramineus*	Little Grassbird	Protected	In wetland adjacent to Subject Land.
Aves	*Meliphaga lewinii*	Lewin's Honeyeater	Protected	In remnant trees adjacent Subject Land
Aves	*Merops ornatus*	Rainbow Bee-eater	Protected	In remnant trees adjacent Subject Land
Aves	*Neochmia temporalis*	Red-browed Finch	Protected	In remnant trees adjacent Subject Land
Aves	*Pachycephala pectoralis*	Golden Whistler	Protected	In remnant trees adjacent Subject Land
Aves	*Pachycephala rufiventris*	Rufous Whistler	Protected	In remnant trees adjacent Subject Land
Aves	*Petrochelidon ariel*	Fairy Martin	Protected	In remnant trees adjacent Subject Land
Aves	*Petrochelidon nigricans*	Tree Martin	Protected	In remnant trees adjacent Subject Land
Aves	*Philemon corniculatus*	Noisy Friarbird	Protected	In remnant trees adjacent Subject Land
Aves	*Phylidonyris niger*	White-cheeked Honeyeater	Protected	In remnant trees adjacent Subject Land
Aves	*Platalea regia*	Royal Spoonbill	Protected	In wetland adjacent Subject Land
Aves	*Plectorhyncha lanceolata*	Striped Honeyeater	Protected	In remnant trees adjacent Subject Land
Aves	*Podargus strigoides*	Tawny Frogmouth	Protected	In remnant trees adjacent Subject Land
Aves	*Porphyrio melanotus*	Australasian Purple Swamphen	Protected	In wetland adjacent Subject Land
Aves	*Psophodes olivaceus*	Eastern Whipbird	Protected	In remnant trees adjacent Subject Land
Aves	*Rhipidura albiscapa*	Grey Fantail	Protected	In remnant trees adjacent Subject Land
Aves	*Rhipidura leucophrys*	Willie Wagtail	Protected	In Subject Land.
Aves	*Sericornis frontalis*	White-browed Scrubwren	Protected	In remnant trees adjacent Subject Land
Aves	*Sphecotheres vieilloti*	Australasian Figbird	Protected	In remnant trees adjacent Subject Land
Aves	*Strepera graculina*	Pied Currawong	Protected	In remnant trees adjacent Subject Land
Aves	*Taeniopygia bichenovii*	Double-barred Finch	Protected	In remnant trees adjacent Subject Land
Aves	*Todiramphus macleayii*	Forest Kingfisher	Protected	In remnant trees adjacent Subject Land
Aves	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	Protected	In remnant trees adjacent Subject Land
Aves	*Trichoglossus haematodus*	Rainbow Lorikeet	Protected	In remnant trees adjacent Subject Land
Aves	*Vanellus miles novaehollandiae*	Masked Lapwing	Protected	In Subject Land.
Aves	*Zosterops lateralis*	Silvereye	Protected	In remnant trees adjacent Subject Land
Gastropoda	*Helix aspersa*	Common Garden Snail	Not Protected Pest	In Subject Land.
Gastropoda	*Laevicaulis alte*	Tropical Leatherleaf Slug	Not Protected Pest	In Subject Land.
Gastropoda	*Limax maximus*	Giant Leopard Slug	Not Protected Pest	In Subject Land.
Gastropoda	*Thersites mitchellae*	Mitchell's Rainforest Snail	Critically Endangered	On the ecotone between the unmown grass and the mown grass surrounding the Sbject Land. Also in the leaf litter below the remnant

Class	Scientific Name	Species	Status BC Act	Where observed
				trees adjacent the Subject Land.
Mammalia	*Melomys cervinipes*	Fawn-footed Melomys	Protected	In remnant trees adjacent Subject Land
Mammalia	*Pteropus alecto*	Black Flying-fox	Protected	In remnant trees adjacent Subject Land
Mammalia	*Rattus rattus*	Black Rat	Not Protected Pest	In Subject Land
Mammalia	*Wallabia bicolor*	Swamp Wallaby	Protected	In remnant trees adjacent Subject Land
Reptilia	*Eulamprus quoyii*	Eastern Water Skink	Protected	In remnant trees adjacent Subject Land
Reptilia	*Intellagama lesueurii*	Eastern Water Dragon	Protected	In remnant trees adjacent Subject Land
Reptilia	*Lygisaurus foliorium*	Iridescent Litter-skink	Protected	In remnant trees adjacent Subject Land
Reptilia	*Pseudechis porphyriacus*	Red-bellied Black Snake	Protected	In remnant trees adjacent Subject Land
Amphibia	*Litoria fallax*	Eastern Dwarf Sedge-frog	Protected	In wetland adjacent to Subject Land. Within Subject Land.
Amphibia	*Litoria gracilenta*	Dainty Tree Frog	Protected	In wetland adjacent Subject Land
Amphibia	*Litoria caerulea*	Green Tree Frog	Protected	In wetland adjacent to Subject Land. Within Subject Land.
Amphibia	*Litoria dentata*	Bleating Tree Frog	Protected	In wetland adjacent Subject Land
Amphibia	*Litoria olongburensis*	Wallum Sedge Frog	Vulnerable	In wetland adjacent Subject Land
Amphibia	*Litoria nasuta*	Rocket Frog	Protected	In wetland adjacent to Subject Land. Within Subject Land.
Amphibia	*Litoria peronii*	Peron's Tree Frog	Protected	In wetland adjacent to Subject Land. Within Subject Land.
Amphibia	*Litoria tyleri*	Tyler's Tree Frog	Protected	In wetland adjacent Subject Land
Amphibia	*Limnodynastes peronii*	Striped Marsh Frog	Protected	In remnant trees adjacent Subject Land
Amphibia	*Crinia signifera*	Common Brown Froglet	Protected	In wetland adjacent to Subject Land. Within Subject Land.
Amphibia	*Crinia tinnula*	Wallum Froglet	Vulnerable	In wetland adjacent Subject Land
Amphibia	*Bufo marinus*	Cane Toad	Not Protected Pest	In wetland adjacent to Subject Land. Within Subject Land.

Appendix B. BAM VIS Field Survey Forms (copied from electronic data sheet)

BAM Site - Field Survey Form

Date:	**17.2.21**	**Plot ID:**	**2**	**Photo #:**	
Zone:	**56J**	**Plot Dimensions:**	**20x50**	**Easting:**	556269
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	290	**Northing:**	6833127
PCT:	1064	**Condition Class**	DNG	**Ecologists:**	Kurtis Lindsay

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance
Grass & grasslike (GG)	Paspalum distichum	45	N/A
Non-native	Cyperus brevifolius	5	
Grass & grasslike (GG)	Digitaria didactyla	10	N/A
Grass & grasslike (GG)	Cynodon dactylon	10	N/A
HTW	Megathyrus maximus	0.5	30
HTW	Paspalum dilatatum	30	
Non-native	Digitaria sanguinalis	10	N/A
Non-native	Euphorbia hirta	0.2	60
Forb (FG)	Centella asiatica	0.2	20
Non-native	Conyza bonariensis	0.1	10
Non-native	Trifolium repens	2	150
Non-native	Lotus corniculatus	0.1	25
Non-native	Lotus pedunculatus	0.2	50
Forb (FG)	Wahlenbergia gracilis	0.1	5
Non-native	Axonopus compressus	0.2	35
Non-native	Gomphrena celosioides	0.2	15
Non-native	Portulaca pilosa	0.1	1

DBH	# Tree Stems Count
80+cm	0
50-79cm	0
30-49cm	0
20-29cm	0
10-19cm	0
5-9cm	0
<5cm	0

Number of Hollow-bearing Trees
0
0
0
0
0
0
0

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Length of Logs (m)	0

(≥10 cm diameter, >50 cm in length)

BAM Attribute (1 x 1m plots)	Litter Cover (%)
1	2
2	1
3	1
4	2
5	1
Average (#no./5)	**1.4**

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

				Growth Form	Composition Data	Structure Data
				Tree	0	0
				Shrub	0	0
				Grass	3	65
				Forb	2	0.3
				Fern	0	0
				Other	0	0
				H.T.W	2	30.5
				Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m		
				Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …		

BAM Site - Field Survey Form

Date:	**17.2.21**	**Plot ID:**	**3**	**Photo #:**	
Zone:	**56J**	**Plot Dimensions:**	**20x50**	**Easting:**	556260
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	295	**Northing:**	6833096
PCT:	None	**Condition Class**	Exotic Dominant	**Ecologists:**	Kurtis Lindsay

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance
HTW	Ricinus communis	5	15
Non-native	Ambrosia artemisiifolia	2	10
Non-native	Setaria sphacelata	15	N/A
Non-native	Conyza bonariensis	0.2	30
Non-native	Cuphea carthagensis	0.5	45
HTW	Paspalum dilatatum	2	200
Grass & grasslike (GG)	Cynodon dactylon	15	N/A
HTW	Cyperus eragrostis	0.6	40
Non-native	Euphorbia hyssopifolia	0.2	50
Grass & grasslike (GG)	Cyperus polystachyos	0.5	25
Forb (FG)	Commelina cyanea	5	
Grass & grasslike (GG)	Digitaria didactyla	2	100
Non-native	Solanum mauritianum	0.1	1
Non-native	Crotalaria incana	0.1	2
Non-native	Sonchus oleraceus	0.1	6
Other (OG)	Vigna luteola	1	30
HTW	Megathyrus maximus	3	40
Non-native	Solanum chenopodioides	0.1	3
Grass & grasslike (GG)	Phragmites australis	0.5	50
Non-native	Solanum lycopersicum	0.2	2
Non-native	Paspalum urvillei	0.2	5
Grass & grasslike (GG)	Echinochloa colona	0.2	30
Non-native	Eleusine indica	0.5	20

DBH	# Tree Stems Count
80+cm	0
50-79cm	
30-49cm	
20-29cm	
10-19cm	
5-9cm	
<5cm	

Number of Hollow-bearing Trees
0

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Length of Logs (m)	0

(≥10 cm diameter, >50 cm in length)

BAM Attribute (1 x 1m plots)	Litter Cover (%)
1	100
2	100
3	100
4	100
5	100
Average (#no./5)	**100**

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Non-native	Cyperus brevifolius	0.2	40	**Growth Form**	**Composition Data**	**Structure Data**
				Tree	**0**	**0**
				Shrub	**0**	**0**
				Grass	**5**	**18.2**
				Forb	**1**	**5**
				Fern	**0**	**0**
				Other	**1**	**1**
				H.T.W	**4**	**10.6**
				Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m		
				Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …		

BAM Site - Field Survey Form

Date:	**24.3.21**	**Plot ID:**	**4**	**Photo #:**	
Zone:	**56J**	**Plot Dimensions:**	**20x50**	**Easting:**	556208
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	192	**Northing:**	6833122
PCT:	None	**Condition Class**	Exotic Dominant	**Ecologists:**	Kurtis Lindsay

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance
Non-native	Setaria sphacelata	75	N/A
Non-native	Solanum mauritianum	5	
HTW	Ipomoea indica	2	400
HTW	Ricinus communis	2	200
HTW	Ageratina adenophora	0.5	50
HTW	Cenchrus clandestinus	5	
Fern (EG)	Hypolepis muelleri	1	100
Grass & grasslike (GG)	Juncus usitatus	0.2	3
HTW	Andropogon virginicus	2	300
Non-native	Digitaria sanguinalis	0.2	10
Non-native	Paspalum urvillei	0.1	5
Forb (FG)	Pratia purpurascens	0.1	20
Non-native	Crassocephalum crepioides	0.1	5
Grass & grasslike (GG)	Schoenus brevifolius	0.5	100
Forb (FG)	Persicaria strigosa	0.1	3
Non-native	Conyza bonariensis	0.1	15
Forb (FG)	Alternanthera denticulata	0.1	2
Non-native	Sonchus asper	0.1	6
Non-native	Cirsium vulgare	0.1	3
HTW	Paspalum dilatatum	2	100
Non-native	Cyperus brevifolius	1	300
Grass & grasslike (GG)	Cynodon dactylon	0.2	30
Non-native	Solanum nigrum	0.1	2

DBH	# Tree Stems Count
80+cm	0
50-79cm	
30-49cm	
20-29cm	
10-19cm	
5-9cm	
<5cm	

Number of Hollow-bearing Trees
0

For **hollows,** count only the presence of a stem containing hollows. For a **multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Length of Logs (m)	
	0

(≥10 cm diameter, >50 cm in length)

BAM Attribute (1 x 1m plots)	Litter Cover (%)
1	100
2	100
3	100
4	98
5	100
Average (#no./5)	**99.6**

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Non-native	Commelina benghalensis	0.1	20			
Non-native	Oxalis debilis	0.1	1	**Growth Form**	**Composition Data**	**Structure Data**
Forb (FG)	Dichondra repens	0.1	2	**Tree**	**0**	**0**
Non-native	Amaranthus sp.	1	1	**Shrub**	**0**	**0**
Forb (FG)	Hydrocotyle tripartita	0.1	30	**Grass**	**4**	**1**
Forb (FG)	Hydrocotyle sibthorpioides	0.1	10	**Forb**	**7**	**0.7**
Forb (FG)	Portulaca oleracea	0.1	3	**Fern**	**1**	**1**
Non-native	Oxalis corniculatus	0.1	5	**Other**	**0**	**0**
HTW	Cyperus eragrostis	0.1	2	**H.T.W**	**7**	**13.6**
Grass & grasslike (GG)	Cyperus difformis	0.1	1	**Cover:** 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m		
				Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …		

Appendix C. Biodiversity Credit Reports from Biodiversity Assessment Method Calculator

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023512/BAAS18059/21/00023513	Byron Bay Bioenergy Facility	24/11/2021
Assessor Name	Report Created	BAM Data version *
Kurtis Lindsay	11/01/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18059	Finalised	11/01/2022
Assessment Revision	Assessment Type	BOS entry trigger
2	Part 4 Developments (Small Area)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

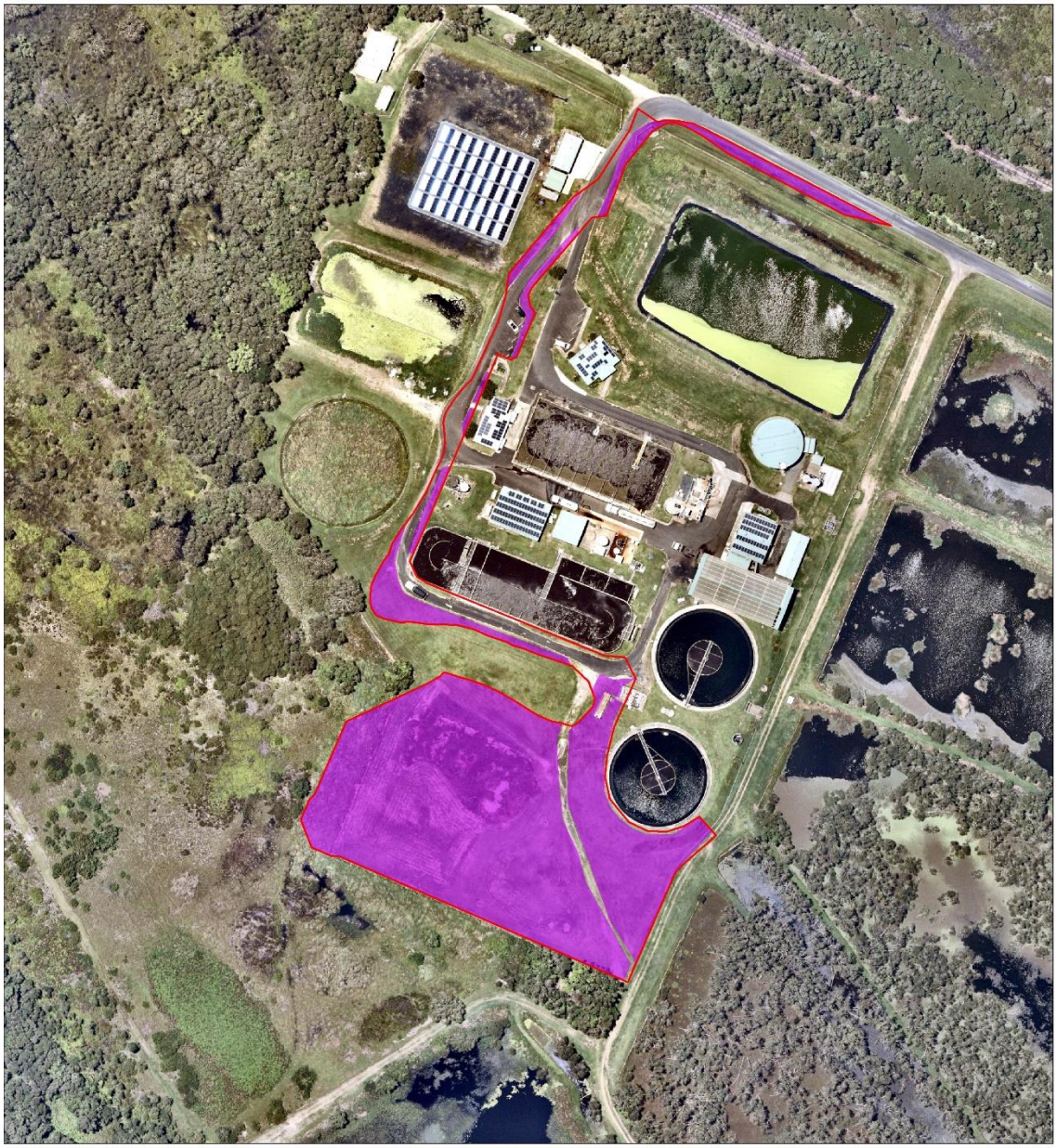
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion												
1	1064_Cleared	Not a TEC	2.4	2.4	0.52	PCT Cleared - 75%	High Sensitivity to Potential Gain			2.00		0
											Subtotal	**0**
											Total	**0**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Crinia tinnula / Wallum Froglet (Fauna)									
1064_Cleared	2.4	2.4	0.52			Vulnerable	Not Listed	False	1
								Subtotal	**1**
Litoria olongburensis / Olongburra Frog (Fauna)									
1064_Cleared	2.4	2.4	0.52			Vulnerable	Vulnerable	False	1
								Subtotal	**1**
Myotis macropus / Southern Myotis (Fauna)									
1064_Cleared	2.4	2.4	0.52			Vulnerable	Not Listed	False	1
								Subtotal	**1**
Planigale maculata / Common Planigale (Fauna)									
1064_Cleared	2.4	2.4	0.52			Vulnerable	Not Listed	False	1
								Subtotal	**1**

Thersites mitchellae / Mitchell's Rainforest Snail (Fauna)									
1064_Cleared	2.4	2.4	0.52			Endangered	Critically Endangered	True	1
								Subtotal	**1**

Appendix D. Species Polygons for Species Credits (Note: there is no credit obligation for this DA but this has been included for completeness of the BDAR)



Appendix E. Test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats (s7.3 of the Biodiversity Conservation Act 2016)

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016 **Nomadic Wetland Birds** 1. *Amaurornis moluccana* (Pale-vented Bush-hen) - Vulnerable 2. *Anseranas semipalmata* (Magpie Goose) - Vulnerable 3. *Botaurus poiciloptilus* (Australasian Bittern) - Endangered 4. Ephippiorhynchus asiaticus (Black-necked Stork) - Vulnerable 5. *Grus rubicunda* (Brolga) - Vulnerable 6. *Haliaeetus leucogaster* (White-bellied Sea-Eagle) - Vulnerable 7. *Pandion cristatus* (Eastern Osprey) - Vulnerable 8. *Irediparra gallinacea* (Comb-crested Jacana) - Vulnerable 9. *Rostratula australis* (Australian Painted Snipe) - Endangered 10. *Stictonetta naevosa* (Freckled Duck) - Vulnerable 11. *Sternula albifrons* (Little Tern) – Vulnerable 12. *Ixobrychus flavicollis* (Black Bittern) - Vulnerable		
Habitat Impacted by this Activity/Development	The proposed development will require the clearing of 0.88 hectare of derived grassland vegetation including 0.36 hectare of non-native pasture, and 0.52 hectare of derived grassland (i.e. lawn) that is comprised of widely cultivated native grasses and is regularly mowed. The habitat is mostly surrounded by chainwaire fencing. A small portion exists outside of the chainwire fencing. No trees or waterbodies will be cleared to facilitate the development. The proposed development may introduce indirect impacts to birds, such as through increased noise and vibration associated with construction and truck movements, however, these impacts will be actively managed. Construction noise/vibration will be short term, and vehicle noise will be significantly reduced through management of vehicle speed/noise emission and through directing traffic through the existing STP site, away from wetland areas. Increased movements of vehicles in and out of the STP from the end of Wallum Place could cause vehicle strike to wetland birds, however, the proposed access road has been designed to pass through the disturbed STP compound, rather than flank a settling pond that functions as wetland habitat. Speed limits will be enforced and signage will be erected to warn vehicle operators of wildlife. There is potential for lighting to impact birds however, this will be managed through active design of lights and keeping lights off at night when offices and other parts of the building are not occupied. No water will be released off the BEF site. Groundwater and surface water will be retained on site and any excess will accumulate in retention ponds which will be regularly pumped-out and disposed of in an appropriate facility.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development has been designed to avoid all direct habitat (i.e. wetland) clearing. The development has been designed to minimise impacts to birds. All of these birds occur as single, wide-spread populations. They are wide-ranging, nomadic and highly mobile. Few of these nomadic bird species are known to breed in the Byron STP property. It is not considered likely that the proposed development will have an adverse effect on the life cycle of any of these bird species such that a viable local population of the species is likely to be placed at risk of extinction. If Council is notified of any breeding by threatened bird species near the development site (e.g. Comb-crested Jacana at H-cell) Council will engage a suitably qualified person to advise the best course of action to reduce potential for indirect impacts.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	N/A
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	A maximum of 0.88 hectares of grassland habitat will be removed. This habitat may be used for forage and shelter by some of these species on occasion however, the habitat is disturbed and located close to an existing operation STP which is regularly occupied by people, machinery and vehicles. Most of the habitat to be impacted is manicured lawn which provides only temporary foraging opportunity (i.e. at night or during heavy rainfall) usage of this habitat is expected to be infrequent and provide no importance to any viable local population.

Test of Significance
(Five Part Test)
s.7.3 of the Biodiversity Conservation Act 2016

Nomadic Wetland Birds

1. *Amaurornis moluccana* (Pale-vented Bush-hen) - Vulnerable
2. *Anseranas semipalmata* (Magpie Goose) - Vulnerable
3. *Botaurus poiciloptilus* (Australasian Bittern) - Endangered
4. Ephippiorhynchus asiaticus (Black-necked Stork) - Vulnerable
5. *Grus rubicunda* (Brolga) - Vulnerable
6. *Haliaeetus leucogaster* (White-bellied Sea-Eagle) - Vulnerable
7. *Pandion cristatus* (Eastern Osprey) - Vulnerable
8. *Irediparra gallinacea* (Comb-crested Jacana) - Vulnerable
9. *Rostratula australis* (Australian Painted Snipe) - Endangered
10. *Stictonetta naevosa* (Freckled Duck) - Vulnerable
11. *Sternula albifrons* (Little Tern) – Vulnerable
12. *Ixobrychus flavicollis* (Black Bittern) - Vulnerable

		The proposed development will not release water or contaminants into the surrounding wetland habitats. Noise and vibration from construction may temporarily impact upon the adjoining habitat, however this will be limited to daylight hours and will be monitored of effects to birds, particularly nesting Jacana on H-cell. In the unlikely event the project impacted on breeding by any of the potentially occurring species, the irregular usage of the habitat for breeding, and the small number of any breeding birds (i.e. 1 -2 pairs) of these wide-ranging, nomadic species impacted is not expected to cause a significant impact to a viable local population.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The proposed development is localised and will not cause fragmentation or isolation of any populations.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be directly impacted comprises disturbed derived grasslands which are not considered important to the long-term survival of any of these species. The wetland habitat located near the development is important to these species in the locality. This wetland habitat will remain unaltered by the development.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	N/A	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development will not contribute or exacerbate any KTP at this location.	

Conclusion
The proposed development will not significantly impact a viable local population of any of these nomadic wetland bird species.

Test of Significance
(Five Part Test)
s.7.3 of the Biodiversity Conservation Act 2016

Migratory Shorebirds

1. *Calidris ferruginea* (Curlew Sandpiper) – Endangered
2. *Charadrius leschenaultii* (Greater Sand Plover) – Endangered
3. *Charadrius mongolus* (Lesser Sand Plover) – Vulnerable
4. *Limicola falcinellus* (Broad-billed Sandpiper) - Vulnerable

Habitat Impacted by this Activity/Development	The proposed development will require the clearing of 0.88 hectare of derived grassland vegetation including 0.3 hectare of non-native pasture, and 0.52 hectare of derived grassland (i.e. lawn) that is comprised of widely cultivated native grasses and is regularly mowed. The habitat is mostly surrounded by chainwaire fencing. A small portion exists outside of the chainwire fencing. No trees or waterbodies will be cleared to facilitate the development. The proposed development may introduce indirect impacts to birds, such as through increased noise and vibration associated with construction and truck movements, however, these impacts will be actively managed. Construction noise/vibration will be short term, and vehicle noise will be significantly reduced through management of vehicle speed/noise emission and through directing traffic through the existing STP site, away from wetland areas. Increased movements of vehicles in and out of the STP from the end of Wallum Place could cause vehicle strike to wetland birds, however, the proposed access road has been designed to pass through the disturbed STP compound, rather than flank a settling pond that functions as wetland habitat. Speed limits will be enforced and signage will be erected to warn vehicle operators of wildlife. There is potential for lighting to impact birds however, this will be managed through active design of lights and keeping lights off at night when offices and other parts of the building are not occupied. No water will be released off the BEF site. Groundwater and surface water will be retained on site and excess will accumulate in retention ponds which will be regularly pumped-out and disposed of in an appropriate facility.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development has been designed to avoid all direct habitat (i.e. wetland) clearing. The development has been designed to minimise impacts to birds. All of these birds occur as single, wide-spread populations. They are wide-ranging, nomadic and highly mobile. All of these species are international, migratory waders that breed in the northern hemisphere and migrate to the Eastern Australia for the austral summer (non-breeding period). These birds only occur at the Byron STP on sporadic occasions.. It is not considered likely that the proposed development will have an adverse effect on the life cycle of any of these bird species such that a viable local population of the species is likely to be placed at risk of extinction.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	N/A
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	A maximum of 0.88 hectares of grassland habitat will be removed. This habitat may be used for forage and shelter by some of these species on occasion however, the habitat is disturbed and located close to an existing operation STP which is regularly occupied by people, machinery and vehicles. Most of the habitat to be impacted is manicured lawn which provides only temporary foraging opportunity (i.e. at night or during heavy rainfall) usage of this habitat is expected to be infrequent and provide no importance to any viable local population. The proposed development will not release water or contaminants into the surrounding wetland habitats. Noise and vibration from construction may temporarily impact upon the adjoining habitat, however this will be limited to daylight hours and will be monitored of effects to birds, particularly nesting Jacana on H-cell. In the unlikely event the project impacted on breeding by any of the potentially occurring species, the irregular usage

Test of Significance **(Five Part Test)** **s.7.3 of the Biodiversity Conservation Act 2016** **Migratory Shorebirds** 1. *Calidris ferruginea* (Curlew Sandpiper) – Endangered 2. *Charadrius leschenaultii* (Greater Sand Plover) – Endangered 3. *Charadrius mongolus* (Lesser Sand Plover) – Vulnerable 4. *Limicola falcinellus* (Broad-billed Sandpiper) - Vulnerable		
		of the habitat for breeding, and the small number of any breeding birds (i.e. 1 -2 pairs) of these wide-ranging, nomadic species impacted is not expected to cause a significant impact to a viable local population.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The proposed development is localised and will not cause fragmentation or isolation of any populations.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be directly impacted comprises disturbed derived grasslands which are not considered important to the long-term survival of any of these species. The wetland habitat located near the development is important to these species in the locality. This wetland habitat will remain unaltered by the development.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	N/A	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development will not contribute or exacerbate any KTP at this location.	
Conclusion The proposed development will not significantly impact a viable local population of any of these migratory shorebird species.		

Test of Significance **(Five Part Test)** **s.7.3 of the Biodiversity Conservation Act 2016** ***Phascolarctos cinereus* (Koala) - Vulnerable**		
Habitat Impacted by this Activity/Development	The proposed development will require the clearing of 0.88 hectare of derived grassland vegetation including 0.3 hectare of non-native pasture, and 0.52 hectare of derived grassland (i.e. lawn) that is comprised of widely cultivated native grasses and is regularly mowed. The habitat is mostly surrounded by chainwaire fencing. A small portion exists outside of the chainwire fencing. No foraging or shelter trees will be cleared to facilitate the development. The proposed development may introduce indirect impacts to any locally occurring koala, such as through increased noise and vibration associated with construction and truck movements, however, these impacts will be actively managed. Construction noise/vibration will be short term, and vehicle noise will be significantly reduced through management of vehicle speed/noise emission and through directing traffic through the existing STP site, away from wooded areas. Increased movements of vehicles in and out of the STP from the end of Wallum Place could cause vehicle strike to koala that walk between habitats, however, the proposed access road has been designed to pass through the disturbed STP compound, rather than flank a settling pond that functions as wetland habitat. Speed limits will be enforced and signage will be erected to warn vehicle operators of wildlife. No water will be released off the BEF site. Groundwater and surface water will be retained on site and any excess will accumulate in retention ponds which will be regularly pumped-out and disposed of in an appropriate facility.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development has been designed to avoid all direct habitat (i.e. tree) clearing. The development has been designed to avoid and minimise impacts to koala. The koala that occur on the Byron STP form part of the Tayagrah koala population. As the development is not causing tree clearing, no direct habitat loss will occur. Indirect impacts could occur through vehicle strike or koalas getting caught in the construction site. These impacts will be managed by enforcing speed limits and ensuring all drivers are aware of the presence of Koala from Wallum Place, into the property. Any sightings of Koalas will be reported to Council. The construction site will be monitored. If any Koala are observed near the construction site, the individual will be monitored and a suitably qualified Ecologist or wildlife carer will be engaged to capture and relocate the Koala to a safer area if neccessary. In the unlikely event a Koala is caught in the construction area, it will be captured, treated and relocated to a safe location outside of the development area.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	N/A
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The development will require clearing of 0.88 hectares of derived grassland which Koala may traverse through. No shelter or forage trees will be cleared. The usage of trees adjacent the development site will be interrupted during construction, however, it is unlikely these scattered/isolated trees are considered to be important for any local Koala population. Extensive suitable areas of habitat occur in the National Park and BioBank site outside of the development area.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The proposed development is localised and will not cause fragmentation or isolation of any populations.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016 *Phascolarctos cinereus* (Koala) - Vulnerable		
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be directly impacted comprises disturbed derived grasslands which are not considered important to the long-term survival of Koala. The usage of trees adjacent the development site will be interrupted during construction, however, it is unlikely these scattered/isolated trees are considered to be important for any local Koala population. Extensive suitable areas of habitat occur in the National Park and BioBank site outside of the development area. None of the habitat proposed to be impacted is considered important to Koala.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	N/A	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development will not contribute or exacerbate any KTP at this location.	
Conclusion The proposed development will not significantly impact a viable local population of Koala.		

Test of Significance
(Five Part Test)
s.7.3 of the Biodiversity Conservation Act 2016

Frogs
Litoria olongburensis (Wallum Sedge-frog) – Vulnerable
Cirnia tinnula (Wallum Froglet) - Vulnerable

Habitat Impacted by this Activity/Development	The proposed development will require the clearing of 0.88 hectare of derived grassland vegetation including 0.3 hectare of non-native pasture, and 0.52 hectare of derived grassland (i.e. lawn) that is comprised of widely cultivated native grasses and is regularly mowed. The habitat is mostly surrounded by chainwaire fencing. A small portion exists outside of the chainwire fencing. No trees or waterbodies will be cleared to facilitate the development. An extensive area of >100 hectares of wetland and swamp forest habitat will continue to occur unaltered outside of the development area. The proposed development may introduce indirect impacts to frogs, such as through increased noise and vibration associated with construction and truck movements, however, these impacts will be actively managed. Construction noise/vibration will be short term, and vehicle noise will be significantly reduced through management of vehicle speed/noise emission and through directing traffic through the existing STP site, away from wetland areas. Further, these frogs are most active at night whereas construction and operation will be limited to daylight hours. Increased movements of vehicles in and out of the STP from the end of Wallum Place could cause vehicle strike to frogs, however, the proposed access road has been designed to pass through the disturbed STP compound, rather than flank a settling pond that functions as wetland habitat. Speed limits will be enforced and signage will be erected to warn vehicle operators of wildlife. There is potential for lighting to impact frogs, however, this will be managed through active design of lights and keeping lights off at night when offices and other parts of the building are not occupied. No water will be released off the BEF site. Groundwater and surface water will be retained on site and excess will accumulate in retention ponds which will be regularly pumped-out and disposed of in an appropriate facility. In the event any potential or acid sulphate soils are uncovered on site they will be contained. If decontamination is required, it will take place in a secure location under the guidance of Engineers. No potential or acid sulphate soils or neutralising agents will be released into the natural environment outside of the BEF.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development has been designed to avoid all remnant, native habitat (i.e. wetland) clearing. Impacts to derived habitat (i.e. grasslands) will cause loss of a maximum of 0.88 hectares of habitat. The frogs that inhabit the Subject Land occur as a single local population which connects with the BioBanking Site and Tyagrah National Park Estate which collectively covers over 100 hectares of suitable habitat for populations of these frog species. It is considered highly unlikely that the proposed development or activity would have an adverse effect on the life cycle of these species such that a viable local population of the species is likely to be placed at risk of extinction.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	N/A
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	A maximum of 0.88 hectares of grassland habitat will be removed. This habitat may be used for forage and shelter by some of these species on occasion however, the habitat is disturbed and located close to an existing operation STP which is regularly occupied by people, machinery and vehicles. Most of the habitat to be impacted is manicured lawn which provides only temporary foraging opportunity (i.e. at night or during heavy rainfall) usage of this habitat is expected to be infrequent and provide no importance to any viable local population. The proposed development will not release water or contaminants into the surrounding wetland habitats.

Test of Significance **(Five Part Test)** **s.7.3 of the Biodiversity Conservation Act 2016** **Frogs** **Litoria olongburensis (Wallum Sedge-frog) – Vulnerable** **Cirnia tinnula (Wallum Froglet) - Vulnerable**		
		No area of wetland or waterbody will be directly cleared to facilitate the development.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The proposed development is localised and will not cause fragmentation or isolation of any populations.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be directly impacted comprises disturbed derived grasslands which are not considered important to the long-term survival of these two species. The wetland habitat located near the development is important to these species in the locality. This wetland habitat will remain unaltered by the development.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	N/A	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development will not contribute or exacerbate any KTP at this location.	
Conclusion The proposed development will not significantly impact a viable local population of these two frog species.		

Test of Significance **(Five Part Test)** **s.7.3 of the Biodiversity Conservation Act 2016** ***Thersites mitchellae* (Mitchells Rainforest Snail) – Critically Endangered**		
Habitat Impacted by this Activity/Development	The proposed development will require the clearing of 0.88 hectare of derived grassland vegetation including 0.3 hectare of non-native pasture, and 0.52 hectare of derived grassland (i.e. lawn) that is comprised of widely cultivated native grasses and is regularly mowed. The habitat is mostly surrounded by chainwaire fencing. A small portion exists outside of the chainwire fencing. No trees or waterbodies will be cleared to facilitate the development. An extensive area of >100 hectares of wetland and swamp forest habitat will continue to occur unaltered outside of the development area. Increased movements of vehicles in and out of the STP from the end of Wallum Place could cause vehicle strike to snails, however, the proposed access road has been designed to pass through the disturbed STP compound, rather than flank a settling pond that functions as wetland habitat. Speed limits will be enforced and signage will be erected to warn vehicle operators of wildlife. There is potential for lighting to impact snails, however, this will be managed through active design of lights and keeping lights off at night when offices and other parts of the building are not occupied. No water will be released off the BEF site. Groundwater and surface water will be retained on site and excess will accumulate in retention ponds which will be regularly pumped-out and disposed of in an appropriate facility. In the event any potential or acid sulphate soils are uncovered on site they will be contained. If decontamination is required, it will take place in a secure location under the guidance of Engineers. No potential or acid sulphate soils or neutralising agents will be released into the natural environment outside of the BEF.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development has been designed to avoid all remnant, native habitat (i.e. wetland) clearing. Impacts to derived habitat (i.e. grasslands) will cause loss of a maximum of 0.88 hectares of habitat. The snails that inhabit the Subject Land are expected to exist as a single local population which connects with the BioBanking Site and Tyagrah National Park Estate and collectively covers over 100 hectares of suitable habitat for the local population. Effort will be taken to salvage and relocate snails outside of the clearing footprint prior clearing, earthworks and construction. Risk of vehicle strike will be avoided and minimised by traversing the access track through an area of disturbed and altered operational STP land, and enforcing speed limits. It is considered highly unlikely that the proposed development or activity would have an adverse effect on the life cycle of Mitchells Rainforest Snail species such that a viable local population of the species is likely to be placed at risk of extinction.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	N/A
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	A maximum of 0.88 hectares of grassland habitat will be removed. This habitat may be used for forage and shelter by some of these species on occasion however, the habitat is disturbed and located close to an existing operation STP which is regularly occupied by people, machinery and vehicles. Most of the habitat to be impacted is manicured lawn which provides only temporary foraging opportunity (i.e. at night or during heavy rainfall) usage of this habitat is expected to be infrequent and provide no importance to the viable local population of Mitchells Rainforest Snail. The proposed development will not release water or contaminants into the surrounding wetland habitats.

Test of Significance **(Five Part Test)** **s.7.3 of the Biodiversity Conservation Act 2016** ***Thersites mitchellae* (Mitchells Rainforest Snail) – Critically Endangered**		
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The proposed development is localised and will not cause fragmentation or isolation of any populations.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be directly impacted comprises disturbed derived grasslands which are not considered important to the long-term survival of these two species. The wetland habitat located near the development is important to these species in the locality. This wetland habitat will remain unaltered by the development.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	N/A	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development will not contribute or exacerbate any KTP at this location.	
Conclusion The proposed development will not significantly impact a viable local population of Mitchells Rainforest Snail.		

Test of Significance
(Five Part Test)
s.7.3 of the Biodiversity Conservation Act 2016

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions Endangered Ecological Community

Habitat Impacted by this Activity/Development	The proposed development will not cause the removal of any trees, shrubs or groundcovers from an occurrence of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. The proposed development is not likely to contribute any significant indirect impacts to an extent of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. Potential impacts such as accidental stormwater discharge, wastewater discharge, impact to tree root zones, fire risk, weed and pathogen spread have all been addressed with appropriate impact mitigation measures.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	N/A	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	The development will not have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction. No extent of this ecological community will be cleared or impacted such that extent will be adversely effected. In the unlikely event that the adjacent occurrence of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions was adversely effected, the loss would be small (i.e. <0.5 hectares) and this is insignificant when compared to the >100 hectares of this ecological community in the locality.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	The development will not substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. In the unlikely event that the adjacent occurrence of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions substantially or adversely modified, the loss would be small (i.e. <0.5 hectares) and this is insignificant when compared to the >100 hectares of this ecological community in the locality. It is not expected that the proposed development will modify or cause the loss of any components of this ecological community. An extent of this community will continue to exist adjacent the development. Potential indirect impacts will be actively prevented and managed in a way that there will be no adverse or substantial modification of the composition of the ecological community.
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	No extent of habitat is likely to be removed or modified as a result of the proposed activity.

Test of Significance
(Five Part Test)
s.7.3 of the Biodiversity Conservation Act 2016

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions Endangered Ecological Community

	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	No extent of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed activity.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	N/A
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	N/A	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development will not contribute or exacerbate any KTP at this location.	

Conclusion
The proposed development will not significantly impact upon a local occurrence of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions Endangered Ecological Community

Appendix F. Letter from NSW Department of Planning Industry and Environment Biodiversity and Conservation Division 20 October 2021

Planning, Industry & Environment

Our Ref: DOC21/794279
Your Ref: DA10.2021.364.1

General Manager
Byron Shire Council
PO Box 219
Mullumbimby NSW 2482

Attention: Mr Gene Mason

Dear Mr Arnold

RE: Bioenergy Facility, 45 Wallum Place, Byron Bay

Thank you for the referral of the proposed Bioenergy Facility at Byron Bay Biodiversity Development Assessment Report (BDAR) via the NSW Planning Portal, seeking comments from the Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment. I appreciate the opportunity to provide input.

From our review of the BDAR, prepared and certified by Accredited Assessor Mr Kurtis Lindsay, it appears the impacts of the development are unlikely to significantly affect threatened species, ecological communities, or their habitats. That is, the biodiversity impacts of the development do not appear to trigger entry into the Biodiversity Offset Scheme (BOS).

Despite this, information provided in the BDAR indicates the Byron Shire Council, as the proponent, has elected to opt into the BOS. Importantly however, there is no option available under the *Biodiversity Conservation Act 2016* to allow a proponent for local development under Part 4 of the *Environmental Planning and Assessment Act 1979* to formally opt into the BOS where biodiversity impacts are unlikely to significantly affect threatened species, ecological communities, or their habitats.

Nonetheless, a proponent can voluntarily lodge a BDAR to assist the council with its evaluation of the development application. However, our advice suggests a voluntarily lodged BDAR does not give the council power to impose a credit retirement obligation as a condition of consent.

Given the existing evidence provided indicates the development does not trigger entry into the BOS, no further comments will be provided by the BCD at this time.

If you have any questions about this advice, please do not hesitate to contact Ms Nicky Owner, Senior Conservation Planning Officer, at nicky.owner@environment.nsw.gov.au or 6659 8254.

Yours sincerely

20 October 2021

DIMITRI YOUNG
Senior Team Leader Planning, North East Branch
Biodiversity and Conservation

Level 8, 24 Moonee Street, (Locked Bag 914), Coffs Harbour NSW 2450 | Ph (02) 6659 8200 | dpie.nsw.gov.au

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Appendix E – Standard Koala Habitat Assessment Report

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Standard Koala Habitat Assessment Report

for

New Bioenergy Facility

45 Wallum Place, Byron Bay

New South Wales 2481 Australia

Report prepared for Byron Shire Council

10 January 2022

Report:	Standard Koala Habitat Assessment Report for New Bioenergy Facility 45 Wallum Place, Byron Bay, New South Wales 2481 Australia
Prepared for:	Byron Shire Council
Prepared by:	Land Eco Consulting Pty Ltd
Date:	10 January 2022
Version:	Draft 1.1

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Any survey of flora and fauna will be unavoidably constrained in a number of respects. In an effort to mitigate those constraints, we applied the precautionary principle described in the methodology section of this report to develop our conclusions. Our conclusions are not therefore based solely upon conditions encountered at the site at the time of the survey. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Land Eco Consulting has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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Report Certification

This report was produced by:

Kurtis Lindsay *BSc (Hons)*

Principal Ecologist
Accredited Biodiversity Assessor (#BAAS18059)
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Document Control

Version	Document Name	Issue Date
Draft 1.0	Standard Koala Habitat Assessment Report for New Bioenergy Facility 45 Wallum Place, Byron Bay, New South Wales 2481 Australia	04/01/2022
Draft 1.1	Standard Koala Habitat Assessment Report for New Bioenergy Facility 45 Wallum Place, Byron Bay, New South Wales 2481 Australia	10/01/2022

Contents

1. Introduction

Land Eco Consulting (Land Eco) was engaged by Byron Shire Council ('the proponent') to prepare this 'Standard Koala Habitat Assessment Report' to address the relevant requirements of the '*Byron Coast Comprehensive Koala Plan of Management*' (BKPOM) (Byron Shire Council 2015) for the proposed Bioenergy Facility (BEF) situated in Lot 2/-/DP 706286 at 45 Wallum Place, Byron Bay New South Wales 2481 Australia (the 'Subject Property') (**Figure 1**).

The proposed development is situated in the 'Brunswick Heads – Tyagarah Koala Management Precinct (KMP) which is detailed in the BKPOM as follows:

> "*The Brunswick Heads – Tyagarah KMP covers an area of approximately 4,005ha within the South Byron Coast KMA as indicated in Figure 6 of the Plan.*
>
> *The objectives for this KMP are to consolidate the existing sub-populations and improve the exchange of genetic material with populations to the west of the koala planning area.*
>
> *Focal Issues: population recruitment, inbreeding, road-kill, habitat loss and/or fragmentation.*"

The BEF is considered a 'large development' which in accordance with the BKPOM means development that has the potential for moderate to significant adverse impacts on koala populations because of its size, type or location. Large development includes development which requires a Test of Significance pursuant to s7.3 of the NSW Biodiversity Conservation Act 2016 (Land Eco 2022).

Large development includes but is not limited to subdivision of land resulting in the creation of additional lots (including rural community title subdivision), multiple occupancy, rural tourist and eco-tourist accommodation, animal boarding or training establishments, industrial retail outlets, depots, warehouse or distribution centres, airstrip, transport depots, truck depots, extractive industries, flood mitigation works and open cut mining.

This report assesses the impact of the proposed development upon Koala (*Phascolarctos cinereus*) from the Bioenergy Facility over a portion of the land comprising the Byron Bay Sewage Treatment Plant. The extent of the development is referred to as 'The Subject Land'.

A Standard Koala Habitat Assessment:

- is required for all development identified as core koala habitat per SEPP 44, with the exception of minor development.
- includes the development footprint as well as other areas that may be directly or indirectly impacted by the proposed development, defined as the study area.
- must be undertaken by a suitably qualified and/or accredited person, in this case, Kurtis Lindsay Principal Ecologist of Land Eco Consulting.

The following are required for a Standard Koala Habitat Assessment:

> (i) An assessment to identify vegetation communities occurring on site and the composition, extent and condition of koala habitat occurring within the study area including identification of any isolated "paddock" trees on partially cleared lands.
>
> (ii) For land outside a KMP include results of the koala survey used to identify core koala habitat using the methodology outlined in Appendix 2 of the Plan or any other suitable method approved by Council. This should include a map or site plan showing the location of sampling site and results, highlighting areas of koala activity.
>
> (iii) A desktop review to identify previous records of koalas within 2.5km of the site.
>
> (iv) A stadia-metric survey that identifies the precise location, identity and DBH of all preferred koala feed trees proposed to be removed, or that occur within 50m of the proposed dwelling.
>
> (v) A report adopting the structure and content shown in Table 2 of the BKPOM (**Table 1**).

TABLE 1. CONTENT AND STRUCTURE OF STANDARD KOALA ASSESSMENT REPORT

Requirement	Section where Addressed in this Report
Study Area	Section 2
(i) Identification of the location and extent of the study area	Section 2
(ii) map or site plan showing the location and type of vegetation communities and areas of koala habitat in the study area and their context and connections in the broader landscape,	Section 2
(iii) a description of the composition, extent and condition of koala habitat occurring within the study area	Section 2
(iv) identification of any isolated "paddock" trees on partially cleared lands;	Section 2
(v) a stadia-metric survey that identifies the precise location, identity and DBH of all preferred koala food trees proposed to be removed, or that occurs within 20m of the proposed development footprint.	Section 2
Methods	Section 3
(i) A description of the methodology used to assess the vegetation within the study area	Section 3
(ii) Justification for any variation in the methodology used to carry out the Koala Habitat Assessment.	Section 3
Results	Section 4
(i) A map or site plan showing: a. the location of survey sites and the activity levels for each field site and any areas determined to be core koala habitat. b. The proposed development footprint including the results of stadia-metric survey that identifies the precise location of all native vegetation proposed to be removed, and preferred koala food trees that occur within 50m of any proposed dwellings.	Section 4
(ii) a table detailing the species name (common and/or botanical), height and DBH for all trees proposed to be removed and/or total area of core koala habitat proposed to be clear (if applicable).	Section 4
(iii) a map or site plan showing the location of any proposed compensation works if koala habitat or preferred koala food trees are being cleared.	Section 4
Discussion	Section 5
(i) Interpretation and discussion of the results and consideration of the direct and indirect impacts of the development on koala habitat within the study area and broader landscape	Section 5
(ii) A discussion of how the results of the assessment have been considered in the design and layout of the development. Include discussion of alternative options and why these have been rejected.	Section 5
(iii) Identification of any limitation in methods and results	Section 5
(iv) Discussion and recommendations of compensatory works, if required.	Section 5
References	References

2. Study Area

The Study Area encompasses the proposed development footprint 'Subject Land' and immediate surrounds including the western end of Wallum Place through to the Sewage Treatment Plan (STP) and surrounding vegetation (**Figure 1**).

Historical vegetation mapping is presented (NSW DPIE 2010) (**Figure 2**) along with a map showing the location and type of vegetation communities and areas of koala habitat in the study area and their context and connections in the broader landscape (**Figure 3**).

Within the study area, koala habitat is mostly comprised of Paperbark Swamp Forest dominated by *Melaleuca quinquenervia* tees that provide feed and shelter for koala (Biolink 2012). No other suitable koala feed trees were observed in the study area, however it is possible that koala may utilise rainforest trees that occur in the understorey of the Paperbark Swamp Forest.

There are no paddock trees in the study area.

The proposed development will not involve any clearing of any koala feed or shelter tree (Northern Tree Care 2021).

A stadia-metric survey that identifies the precise location, identity and diameter at breast height (DBH) of all preferred koala food trees proposed to be removed, or that occurs within 20m of the proposed development footprint was carried out by a qualified Surveyor and qualified Consulting Arborist (Northern Tree Care 2021).

The proposed development has been deliberately positioned in a location avoids direct clearing or impediment of 'Habitat Buffer Areas' and 'Koala Corridors' as detailed in the BKPOM.

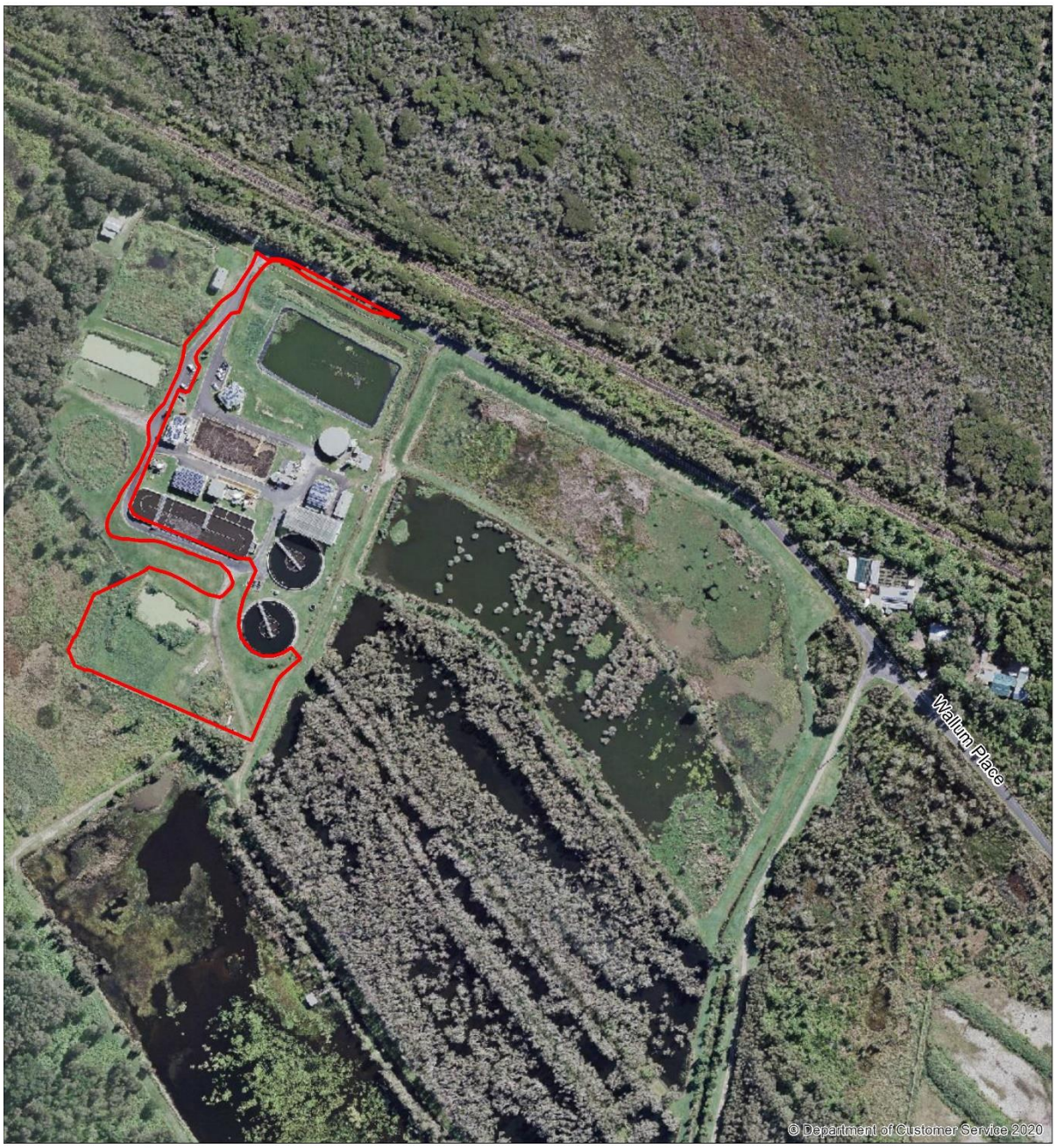


FIGURE 1. THE EXTENT OF THE STUDY AREA ENCOMPASSING THE SUBJECT LAND AS WELL AS OTHER AREAS THAT MAY BE DIRECTLY OR INDIRECTLY IMPACTED BY THE PROPOSED DEVELOPMENT

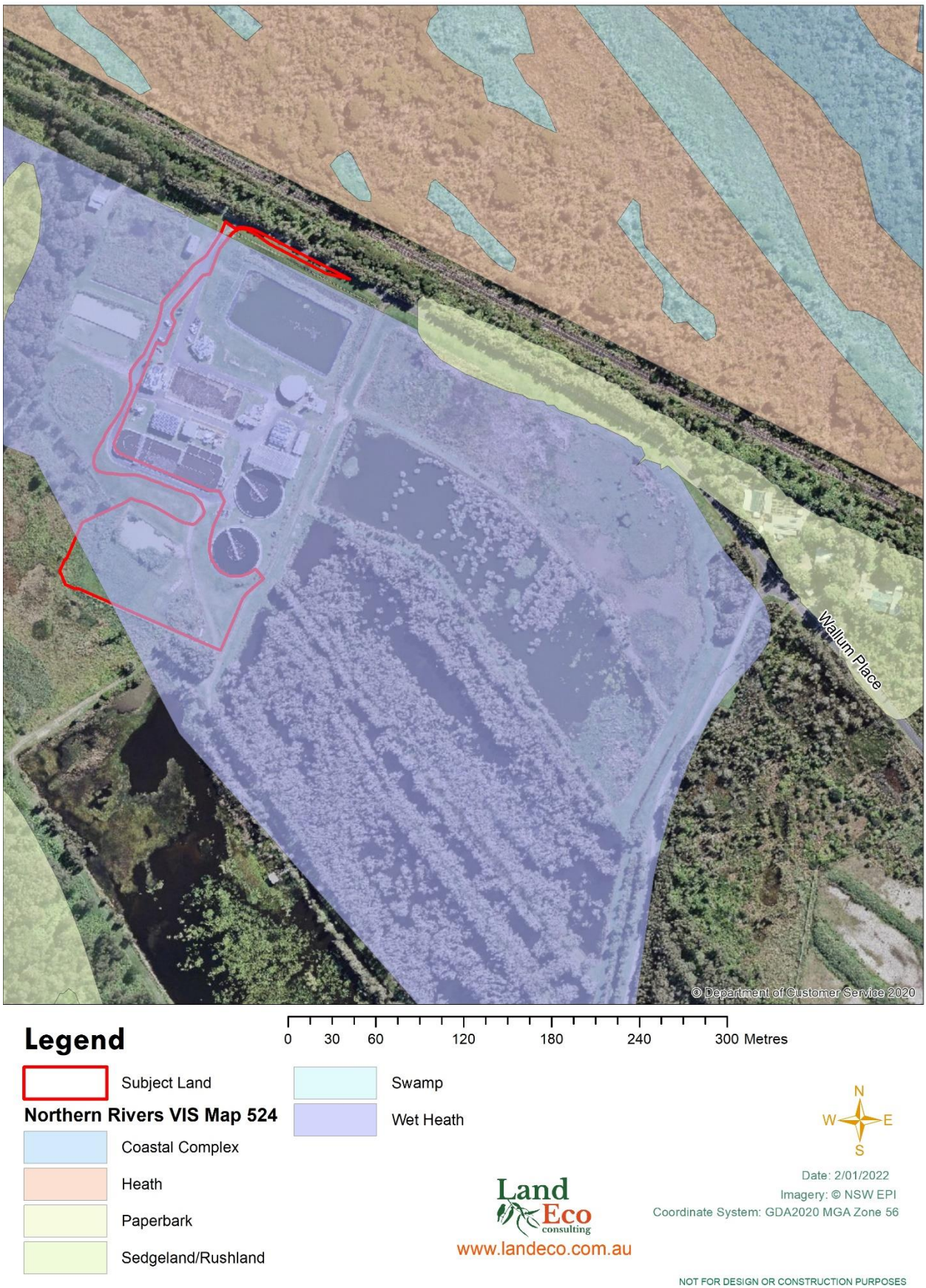


FIGURE 2. LOCATION AND TYPE OF HISTORICALLY MAPPED VEGETATION COMMUNITIES AND AREAS OF KOALA HABITAT IN THE STUDY AREA

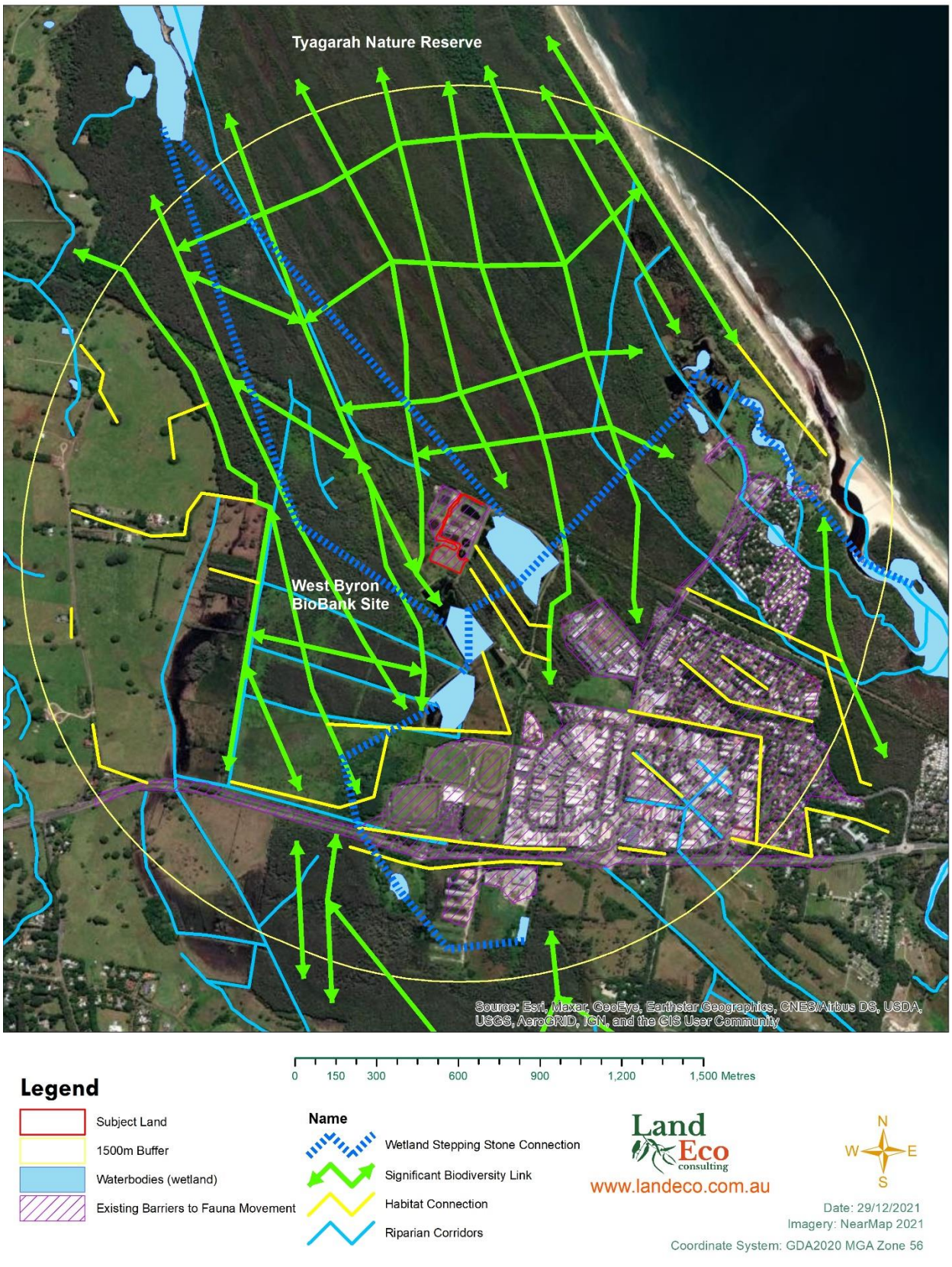


FIGURE 3. CONTEXT AND CONNECTIONS IN THE BROADER LANDSCAPE

3. Methods

3.1 Desktop Assessment

In preparing this report, Land Eco carried-out the following tasks in relation to the Subject Property carried-out a desktop assessment including:

- Review historical Koala records within 2.5 kilometres of the site from the following data sources NSW Wildlife Atlas (BioNet 2021)
- Review of Byron Bird Buddies (2021) report

3.2 Koala Survey

Land Eco conduct a field-based survey of all suitable vegetation within 50 metres of the proposed development.

This involved:

- 10 nights of spotlighting to detect Koala eyeshine (**Table 2**);
- 10 nights of broadcasting of pre-recorded Koala bellows using a portable loudspeaker **(Table 2)**;
- Searches for scats and scratches on and underneath potential feed trees;
- Deployment of two songmeter devices over a minimum of 10 nights.
- Deployment of automated cameras facing *Melaleuca quinquenervia* over a minimum of 10 nights.

More detail on the survey methods is presented in the Biodiversity Development Assessment Report (BDAR) (Land Eco 2021).

TABLE 2. SURVEY TECHNIQUES EMPLOYED BY SUITABLY QUALIFIED PERSON

Date	Survey Technique	Effort
27 January 2021	• Diurnal searches. • Scat searches.	Two person hours
16 February 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting • Songmeter deployment	Two person hours
17 February 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting • Songmeter deployment	Two person hours
18 February 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting • Songmeter deployment	Six person hours
23 March 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting • Songmeter deployment	Six person hours
24 March 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting • Songmeter deployment	Six person hours
25 March 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting • Songmeter deployment	Six person hours
26 March 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting • Songmeter deployment	Six person hours
27 March 2021	• Diurnal searches. • Scat searches. • Spotlighting. • Koala call broadcasting	Six person hours

Date	Survey Technique	Effort
	• Songmeter deployment	

3.3 Vegetation Assessment

To assess the vegetation within the study area, Land Eco:

a. Overlaid the Northern Rivers VIS Mapping (DPIE 2010) over recent aerial imagery in ArcMap Geographical Information System (GIS).

b. Overlaid the Subject Land on the vegetation mapping in GIS.

c. Visited all patches of woody vegetation and confirmed the dominant tree species within the study area.

d. Mapped the locations of the native vegetation in-field with handheld GPS,

e. Provided this field data to a qualified Surveyor and Draftsperson (Kennedy Surveying) who mapped up the location of vegetation and trees to survey-level accuracy.

4. Results

4.1 Results of Koala Survey

The suitably qualified and experienced person recorded no individual koala, nor signs of any koala within or near the Subject Land during the survey effort.

A suite of locally common mammal species were recorded during the survey effort outlined in (**Figure 3**).

TABLE 3. MAMMALS RECORDED IN THE SUBJECT LAND BY THE SUITABLY QUALIFIED PERSON

Mammalia	*Scientific Name*	Common Name
Mammalia	*Wallabia bicolor*	Swamp Wallaby
Mammalia	*Rattus rattus*	Black Rat
Mammalia	*Melomys cervinipes*	Fawn-footed Melomys
Mammalia	*Pteropus alecto*	Black Flying-fox

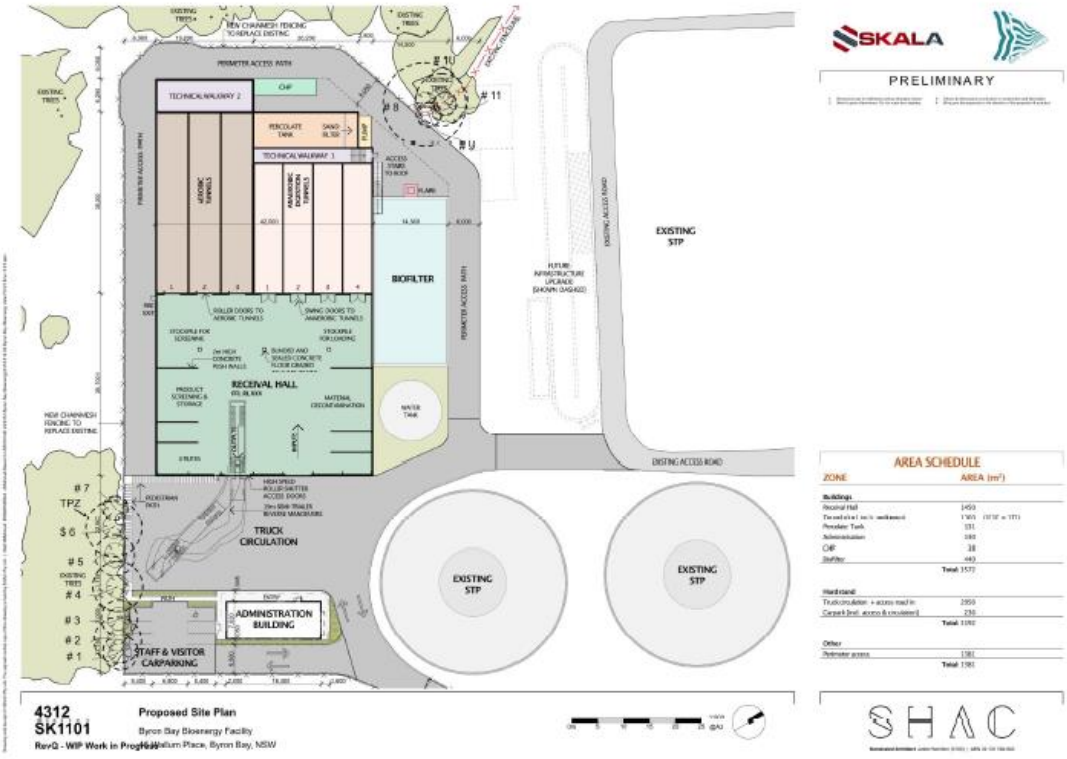
4.2 Proposed Development Footprint and Tree Survey

The results of the Consulting Arborist Assessment of the proposed development footprint included a survey plan that identified the precise location of all native vegetation proposed to be removed, and preferred koala food trees that occur within 50m of any proposed dwellings is provided.

A table detailing the species name (common and/or botanical), height and DBH for all trees immediately adjacent the development is presented (**Table 4**). These trees are illustrated in a survey-plan (**Figure 4**). All of these trees will be retained and protected in accordance with the recommendations of the Consulting Arborist (Northern Tree Care 2021).

TABLE 4. TREES IDENTIFIED WITHIN CLOSE PROXIMITY OF THE PROPOSED DEVELOPMENT FOOTPRINT (NORTHERN TREE CARE 2021)

Tree #	Name	Age	Condition	Height m	DBH mm	TPZ m	Comments
1	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	12	280	3.4	Near the proposed car park
2	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	12	380	4.6	"
3	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	12	290	3.5	"
4	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	12	400	4.8	"
5	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	12	320	3.8	"
6	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	12	450	5.4	"
7	Bangalow Palm *Archontophoenix cunninghamiana*	Mature	Good	8	200	2.5	"
8	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	10	670	8.0	Growing near a proposed new access road
9	Achronychia *Achronychia imperforata*	Mature	Good	7	200	2.4	Growing just inside the fence
10	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	8	420	5.0	"
11	Broad Leaf Paperbark *Melaleuca quinquenervia*	Mature	Good	7	270	3.2	Growing just inside the fence



West Byron Bioenergy Facility Arborist Report. Compiled by: Northern Tree Care. 19 Apr 2021

FIGURE 4. PROPOSED DEVELOPMENT FOOTPRINT INCLUDING THE RESULTS OF STADIA-METRIC SURVEY THAT IDENTIFIES THE PRECISE LOCATION OF NATIVE VEGETATION, AND PREFERRED KOALA FOOD TREES THAT OCCUR WITHIN 50M OF THE DEVELOPMENT. NO NATIVE TREES OR VEGETATION WILL BE REMOVED FOR THIS DEVELOPMENT.

4.3 Historical Koala Records

Historical records of Koala from within 2.5km of the subject land (**Figure 5**). A full list of records is provided (**Appendix 1**).

FIGURE 5. KOALA SIGHTINGS FROM NSW WILDLIFE ATLAS WITHIN 2.5KM OF SUBJECT LAND

5. Discussion

This section of the report provides interpretation and discussion of the results and consideration of the direct and indirect impacts of the development on koala habitat within the study area and broader landscape. It also provides a discussion of how the results of the assessment have been considered in the design and layout of the development including alternative options.

5.1 Compensation Works

This project does not require the removal of any *preferred koala food trees* therefore no compensation works are proposed.

5.2 Development Standards for Large Development

Approval for clearing of vegetation will only be granted if Council is satisfied:

a) all feasible ways of avoiding the vegetation removal have been examined and demonstrated to be unachievable. Appropriate documentation must be submitted with the development application:

b) the clearing will not increase fragmentation, sever or otherwise disturb vegetated linkages between areas of core or potential koala habitat;

c) the removal of vegetation is to be undertaken to the minimal possible extent;

d) priority has been given to the retention of preferred koala food trees >250mm DBH;

e) where the applicant has demonstrated to Councils satisfaction that removal of core koala habitat or preferred koala food trees is unavoidable then the development applicant must be consistent with habitat compensation provisions as per Section 13 of this Plan.

f) the applicant has demonstrated to the satisfaction of Council that the protection of all vegetation to be retained is consistent with the requirements of AS 4970-2009 (Protection of Trees on Development Sites).

g) any clearing does not include trees that a koala habitat assessment has demonstrated are used by koalas.

The proposal does not require any native tree (woody vegetation) removal, other than removal of some derived native grass (lawn). Priority has been given to retention of all preferred koala food trees.

5.3 Avoid, Minimise and Mitigate

For all development applications:

a) The principles of avoidance, minimisation and mitigation of impacts on core koala habitat and preferred koala feed trees must be applied.

b) The applicant must demonstrate by way of stadia survey that removal and/ or impact on core koala habitat and preferred koala feed trees has been avoided to the maximum extent possible through the development location, design, construction and management of development activities

The proposed development is positioned in an area mapped as core koala habitat, however, it has been deliberately positioned to avoid impacts to all preferred koala feed trees, under the advice of a qualified Consulting Arborist (Northern Tree Care 2021). This is demonstrated in (**Figure 4**).

5.4 Bushfire Asset Protection Zones

The proposed development does not require the management of any bushfire Asset Protection Zone (APZ) that requires clearing or management of trees.

5.5 Protection of Koalas from Disturbance

No clearing of land will commence until the area proposed for clearing has been inspected for the presence of koalas and approval given in writing by a suitably qualified and/or accredited person. This person (or a nominated representative) must remain on site during any approved clearing of vegetation.

Approval to proceed with the clearing of vegetation in accordance with this section is only valid for the day on which the inspection has been undertaken.

Clearing of native vegetation and/or earthworks as part of any development consent from Council will be temporarily suspended within a range of 25m from any tree which is concurrently occupied by a koala and must not resume until the koala has moved from the tree of its own volition.

5.6 Swimming Pools

This project does not incorporate swimming pools or similar water bodies. Stormwater and/or leachates will be temporarily stored in tanks before being taken offsite to a licensed facility.

5.7 Fencing

During and post development, an extensive natural vegetated corridor will remain that connects the entirety of the Subject Property north and south. Fencing of the proposed BEF must be designed and maintained to keep the facility secure from access by people, and large wildlife (i.e. Koala). If a Koala accidentally enters the compound suitably qualified persons will be contacted immediately to undertake its capture, treatment and relocation.

5.8 Road design

Road design standards and/or approved vehicle calming devices will be incorporated such that motor vehicles are restricted to a maximum speed of 40km/hour within the development area. The actual, approved speed limit of the facility will be substantially lower than this.

No new roads are proposed that traverse areas of core koala habitat and are predicted to accommodate in excess of 1,500 vehicle movements/day.

5.9 Compensation for loss of koala habitat

The proposed development requires no clearing of native vegetation that forms koala habitat. Not a single tree will be cleared for the proposed development.

An area of derived grassland that is dominated by widely cultivated native grass species will be cleared however, this grassland provides no potential koala habitat and is located in a disturbed STP compound surrounded by a cyclone fence, therefore provides no useable habitat for Koala.

References

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BioNet (2022) Atlas of Living Australia Spatial Portal. Phascolarctos cinereushttps://spatial.ala.org.au/ [Accessed 04/01/2022]

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Byron Shire Council (2015) Byron Coast Comprehensive Koala Plan of Management. Byron Shire Council, Mullumbimby, NSW.

Land Eco Consulting (2022) Biodiversity Development Assessment Report New Bioenergy Facility 45 Wallum Place, Byron Bay New South Wales 2481 Australia Report prepared for Byron Shire Council

Northern Tree Care (2021) Arboricultural Impact Assessment Report Wallum Place, Byron Bay Client: Skala Australasia Pty Ltd 13/21 Babilla Ct Beresfield NSW 2322 19 Apr 2021

NSW Department of Planning, Industry and Environment (DPIE) (2010) Vegetation Map for the Northern Rivers CMA VIS_ID 524

Appendix

Appendix 1. Koala Records from within 2.5km of the Subject Land (Bionet 2022)

Source	Date	Number Koala Individuals	Details of record	Easting	Northing	Accuracy (metres)
Dan Lunney's Community Wildlife Survey	1/07/2004	0		558739	6831595	10000
Dan Lunney's Community Wildlife Survey	1/07/2004	0		554104	6835308	10000
Dan Lunney's Community Wildlife Survey	1/07/2004	0		558480	6831592	10000
Dan Lunney's Community Wildlife Survey	1/01/1980	3		554870	6834783	10000
Dan Lunney's Community Wildlife Survey	1/01/1980	1		555231	6832443	10000
Dan Lunney's Community Wildlife Survey	1/07/2004	0		554802	6835292	10000
Dan Lunney's Community Wildlife Survey	1/07/2004	1		555198	6835382	10000
Dan Lunney's Community Wildlife Survey	1/01/1980	0		558693	6831688	10000
Dan Lunney's Community Wildlife Survey	1/01/1980	0		554726	6835402	10000
Dan Lunney's Community Wildlife Survey	1/07/2004	12		554206	6832105	10000
DPIE Data from Scientific Licences dataset	24/01/2007	1	West Byron Sewage Treatment Plant	556052	6832791	5
DPIE Data from Scientific Licences dataset	31/08/2016	0	West Byron	557141	6831718	100
DPIE Data from Scientific Licences dataset	6/11/2014	1	394 Ewingsdale RD Byron Bay	557873	6831587	20
DPIE Data from Scientific Licences dataset	4/08/2013	1	6 Jacaranda Drive Byron Bay	557430	6832382	20
DPIE Data from Scientific Licences dataset	13/06/2013	1	9 Plantation Drive	554310	6831207	20
DPIE Data from Scientific Licences dataset	14/08/2012	1	Corner of Ewingsdale Road and McGettigans Lane	554774	6832123	50
DPIE Data from Scientific Licences dataset	12/07/2012	2	Ewingsdale Rd Byron bay	557762	6831446	20
DPIE Data from Scientific Licences dataset	1/11/2010	1	Jacaranda Drive, Byron Bay	557427	6832379	20
DPIE Data from Scientific	1/09/2010	1	Melaleuca Lane Byron Bay	557200	6831051	30

Source	Date	Number Koala Individuals	Details of record	Easting	Northing	Accuracy (metres)
Licences dataset						
DPIE Data from Scientific Licences dataset	28/11/2007	0	Belongil Creek, Byron Bay	557898	6831288	100
DPIE Data from Scientific Licences dataset	28/11/2007	0	Belongil Creek, Byron Bay	557877	6831283	100
DPIE Data from Scientific Licences dataset	30/04/2016	1	Tyagarah Nature Reserve	555117	6835669	10
DPIE Data from Scientific Licences dataset	18/08/2017	1	Ewingsdale Road Byron Bay	557853	6831585	3
DPIE Data from Scientific Licences dataset	9/12/2017	1	18 Sunrise Boulevard, Byron Bay NSW	557185	6832465	25
DPIE Data from Scientific Licences dataset	17/07/2017	1	2 Border Street, Byron Bay, New South Wales, Australia	558934	6832179	10
DPIE Data from Scientific Licences dataset	27/05/2017	1	Low in Tree	554072	6831142	25
DPIE Data from Scientific Licences dataset	26/10/2018	0	Belongil Fields	557851	6831589	3
DPIE Data from Scientific Licences dataset	28/07/2019	1	11 Bay Vista Lane Ewingsdale	554727	6830662	10
DPIE Default Sightings	23/01/2013	2	Adjacent to Black Rocks Road, Tyagarah NR	555809	6835520	10
DPIE Default Sightings	2/11/2010	1	Ewingsdale Road, west Byron Bay	557750	6831457	7
DPIE Default Sightings	2/11/2010	1	Ewingsdale Road, west Byron Bay	557666	6831434	7
DPIE Default Sightings	3/11/2010	1	Ewingsdale Road, west Byron Bay	557822	6831346	7
DPIE Default Sightings	13/03/2015	1	Belongil Estuary	557421	6833113	4
DPIE Default Sightings	19/07/2012	1	Camera site north of Black Rock Road within Tyagarah Nature Reserve	555730	6835624	5
DPIE Default Sightings	11/08/2016	1	Mother and baby koala in swamp mahogany tree	555808	6835519	1
NPA Great Koala Count	1/10/2013	0	No location description provided	557068	6832670	500
NPA Great Koala Count	1/10/2013	0	No location description provided	557185	6832878	500
NPA Great Koala Count	1/10/2013	0	No location description provided	557266	6833074	500
NPA Great Koala Count	16/11/2014	1	Byron	557179	6832864	1000
NPA Great Koala Count	16/11/2014	1	Byron	557177	6832867	1000
Wildlife Rehab Database	6/01/2012	0	Postcode only provided:2481	554709	6831095	6458
Wildlife Rehab Database	1/10/2012	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	18/10/2012	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	22/11/2012	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	23/11/2012	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	14/12/2012	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464

Source	Date	Number Koala Individuals	Details of record	Easting	Northing	Accuracy (metres)
Wildlife Rehab Database	17/02/2013	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	17/02/2013	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	20/02/2013	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	17/09/2014	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	2/10/2014	0	Suburb only provided: Byron Bay, 2360	558830	6830935	2464
Wildlife Rehab Database	4/10/2014	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	4/11/2014	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	4/11/2014	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	28/04/2015	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	9/08/2015	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	16/08/2015	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	19/08/2015	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	31/08/2015	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	23/02/2017	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	18/03/2017	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	7/04/2017	0	Suburb only provided: Byron Bay, NSW, 2360	558830	6830935	2464
Wildlife Rehab Database	14/06/2017	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	26/06/2013	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	28/10/2013	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	7/11/2013	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	5/01/2014	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	13/01/2014	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	19/01/2014	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	25/01/2014	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	12/06/2014	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	11/10/2015	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	31/12/2015	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	1/01/2016	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	1/10/2016	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	13/10/2016	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	30/10/2016	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	7/11/2016	0	Suburb only provided: Byron Bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	6/07/2017	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464

Source	Date	Number Koala Individuals	Details of record	Easting	Northing	Accuracy (metres)
Wildlife Rehab Database	12/09/2017	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	17/12/2017	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	18/04/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	4/12/2017	0	Byron Bay, 2481	558831	6830934	30
Wildlife Rehab Database	8/03/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	30/08/2017	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	7/09/2017	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	9/06/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	17/07/2017	0	Belongil Beach, Byron Bay, 2481	558679	6832445	500
Wildlife Rehab Database	18/09/2017	0	Sunrise, Byron Bay, 2481	557476	6831933	1000
Wildlife Rehab Database	14/08/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	19/08/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	27/10/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	6/10/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	2/06/2019	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	31/08/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	26/12/2018	0	Suburb only provided: Byron Bay, 2481	558830	6830935	2464
Wildlife Rehab Database	15/10/2011	0	Cnr Brookwiew & Parkway Drive, Ewingsdale, NSW, 2481	554554	6831147	300
Wildlife Rehab Database	5/01/2012	0	Sunrise Rd-100m from Ewingsdale Rd T/O, Byron Bay, NSW, 2481	557944	6832140	100
Wildlife Rehab Database	21/07/2012	0	Splendour in the Grass site Belongil Fields, Byron Bay, NSW, 2481	557843	6831822	30
Wildlife Rehab Database	21/08/2012	0	Ewingsdale Rd (near island quarry), Byron Bay, NSW, 2481	555910	6832079	250
Wildlife Rehab Database	13/10/2012	0	McGettigans Lane, Ewingsdale, NSW, 2481	554910	6831304	500
Wildlife Rehab Database	9/09/2013	0	540 Ewingsdale Rd, Byron Bay, NSW, 2481	557851	6832009	30
Wildlife Rehab Database	6/11/2013	0	21 Plantation Drive, Ewingsdale, NSW, 2481	554144	6831218	30
Wildlife Rehab Database	11/12/2013	0	7 Banksia Drive, Byron Bay, NSW, 2481	557267	6832173	30
Wildlife Rehab Database	21/10/2014	0	Byron Bay Tourist Village-399 Ewingsdale Rd, Byron Bay, NSW, 2481	557981	6832171	500
Wildlife Rehab Database	13/08/2016	0	Ewingsdale Road - 500m from Byron Hospital, Ewingsdale, NSW, 2481	554327	6832130	500
Wildlife Rehab Database	2/11/2016	0	106 Parkway Dr, Ewingsdale, NSW, 2481	554326	6831355	30
Wildlife Rehab Database	8/07/2017	0	73 Sunrise Boulevard, Sunrise Beach, NSW, 2481	557647	6832305	10
Wildlife Rehab Database	17/07/2017	0	Beaumont Guest House, 2 Border Street, Belongil, NSW, 2481	558929	6832194	10
Wildlife Rehab Database	18/09/2017	0	29 Sunrise Bvd, Byron Bay, NSW, 2481	557356	6832485	10
Wildlife Rehab Database	19/11/2017	0	10 Brookview Court, Ewingsdale, NSW, 2481	554691	6831197	10
Wildlife Rehab Database	13/02/2018	0	41 Sunrise Blvd, Byron Bay, NSW, 2481	557432	6832492	10

Source	Date	Number Koala Individuals	Details of record	Easting	Northing	Accuracy (metres)
Wildlife Rehab Database	1/06/2018	0	2 Tasha Place, Ewingsdale, NSW, 2481	554342	6831439	10
Wildlife Rehab Database	11/07/2018	0	373 Ewingsdale Rd, Byron Bay, NSW, 2481	557656	6832002	10
Wildlife Rehab Database	18/06/2019	0	130 Parkway Drive, Ewingsdale, NSW, 2481	554346	6831141	10
Wildlife Rehab Database	8/11/2019	0	Ewingsdale Rd, Belongil Fields Caravan Park, Ewingsdale, NSW,	557622	6831906	500
Wildlife Rehab Database	11/10/2014	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	11/05/2017	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	4/10/2011	0	Postcode only provided:2481	554709	6831095	6458
Wildlife Rehab Database	12/02/2014	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	23/04/2014	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	13/04/2016	0	Suburb only provided: Byron bay, NSW, 2481	558830	6830935	2464
Wildlife Rehab Database	8/02/2018	0	1 Hill View Place, Ewingsdale, NSW, 2481	554897	6830873	10
Wildlife Rehab Database	4/12/2018	0	1 Tasha Close, Ewingsdale, NSW, 2481	554342	6831456	10
Wildlife Rehab Database	25/09/2018	0	10 Figtree Court, Ewingsdale, NSW, 2481	554573	6831151	10
Wildlife Rehab Database	23/10/2018	0	10 Figtree Court, Ewingsdale, NSW, 2481	554544	6831196	10
Wildlife Rehab Database	5/01/2019	0	106 Parkway Drive, Ewingsdale, NSW, 2481	554340	6831340	10
Wildlife Rehab Database	21/08/2012	0	12 Plantation Drive, Byron Bay, NSW, 2481	554228	6831378	30
Wildlife Rehab Database	23/11/2012	0	13 Coachwood Close, Byron Bay, NSW, 2481	557537	6832293	30
Wildlife Rehab Database	10/10/2013	0	130 Grays Lane, Tyagarah, NSW, 2481	554331	6835548	30
Wildlife Rehab Database	20/05/2018	0	14 Brookview Court, Ewingsdale, NSW, 2481	554705	6831225	10
Wildlife Rehab Database	4/10/2018	0	14 Hill View Place, Ewingsdale, NSW, 2481	554815	6830687	10
Wildlife Rehab Database	4/10/2018	0	14 Hill View Place, Ewingsdale, NSW, 2481	554818	6830666	10
Wildlife Rehab Database	18/08/2012	0	141 Bilongil Cres., Byron Bay, NSW, 2481	557594	6832440	30
Wildlife Rehab Database	18/04/2018	0	14B Valley Court, Ewingsdale, NSW, 2481	553960	6831156	10
Wildlife Rehab Database	29/12/2019	0	156 Mcgettigans Lane, Ewingsdale, NSW, 2481	554736	6830648	30
Wildlife Rehab Database	17/09/2014	0	17 Coachwood Close, Sunrise Beach, NSW, 2481	557568	6832318	30
Wildlife Rehab Database	20/04/2018	0	18 Brookview Court, Ewingsdale, NSW, 2481	554728	6831205	10
Wildlife Rehab Database	20/05/2018	0	18 Brookview Court, Ewingsdale, NSW, 2481	554728	6831205	10
Wildlife Rehab Database	9/12/2017	0	18 Sunrise Boulevard, Byron Bay, NSW, 2481	557193	6832502	10
Wildlife Rehab Database	24/03/2018	0	2 Angus Place, Ewingsdale, NSW, 2481	554643	6831531	10
Wildlife Rehab Database	2/01/2019	0	2 Angus Place, Ewingsdale, NSW, 2481	554626	6831561	10
Wildlife Rehab Database	9/01/2019	0	2 Angus Place, Ewingsdale, NSW, 2481	554626	6831561	10
Wildlife Rehab Database	25/01/2019	0	2 Angus Place, Ewingsdale, NSW, 2481	554429	6831533	10
Wildlife Rehab Database	15/12/2012	0	2/21 Sunrise Blvd., Byron Bay, NSW, 2481	557280	6832515	30

Source	Date	Number Koala Individuals	Details of record	Easting	Northing	Accuracy (metres)
Wildlife Rehab Database	4/09/2019	0	20 Acacia Street, Byron Bay, NSW, 2481	557042	6832179	30
Wildlife Rehab Database	24/06/2012	0	20 Taylors Lane, Ewingsdale, NSW, 2481	554492	6830668	30
Wildlife Rehab Database	16/12/2012	0	21 Taylors Lane, Ewingsdale, NSW, 2481	554378	6830619	30
Wildlife Rehab Database	16/12/2012	0	21 Taylors Lane, Ewingsdale, NSW, 2481	554378	6830619	30
Wildlife Rehab Database	31/07/2017	0	21 Taylors Lane, Ewingsdale, NSW, 2481	554378	6830620	10
Wildlife Rehab Database	21/01/2013	0	23 Sunrise Blvd., Byron Bay, NSW, 2481	557296	6832504	30
Wildlife Rehab Database	8/06/2013	0	23 Sunrise Blvd., Byron Bay, NSW, 2481	557296	6832504	30
Wildlife Rehab Database	29/08/2019	0	24 Julian Rocks Drive, Byron Bay, NSW, 2481	557222	6832612	10
Wildlife Rehab Database	9/10/2018	0	24 Valley Court, Ewingsdale, NSW, 2481	553964	6831160	10
Wildlife Rehab Database	20/08/2019	0	25 Sunrise Boulevard, Byron Bay, NSW, 2481	557316	6832498	10
Wildlife Rehab Database	16/04/2019	0	3 Tahra Crescent, Ewingsdale, NSW, 2481	554801	6831511	10
Wildlife Rehab Database	13/08/2019	0	36 Julian Rocks Drive, Byron Bay, NSW, 2481	557309	6832545	10
Wildlife Rehab Database	4/08/2019	0	373 Ewingsdale Road, Byron Bay, NSW, 2481	557629	6832013	10
Wildlife Rehab Database	27/09/2019	0	373-371 Ewingsdale Road, Byron Bay, NSW, 2481	557438	6832017	30
Wildlife Rehab Database	6/06/2019	0	373-391 Ewingsdale Road, Byron Bay, NSW, 2481	557738	6832074	10
Wildlife Rehab Database	3/09/2015	0	39 Sunrise Blvd, Ewingsdale, NSW, 2481	557433	6832454	30
Wildlife Rehab Database	28/07/2013	1	394 Ewingsdale Rd, Byron Bay, NSW, 2481	557681	6831697	30
Wildlife Rehab Database	30/03/2015	0	394 Ewingsdale Rd, Byron Bay, NSW, 2481	557681	6831697	30
Wildlife Rehab Database	8/08/2014	0	399 Ewingsdale Rd, Byron Bay, NSW, 2481	558103	6832248	30
Wildlife Rehab Database	26/11/2013	0	4 Jacaranda Drive, Byron Bay, NSW, 2481	557455	6832387	30
Wildlife Rehab Database	3/04/2018	0	40 Avocado Crescent, Ewingsdale, NSW, 2481	554099	6831709	10
Wildlife Rehab Database	8/05/2018	0	40 Avocado Crescent, Ewingsdale, NSW, 2481	554099	6831709	10
Wildlife Rehab Database	8/05/2018	0	40 Avocado Crescent, Ewingsdale, NSW, 2481	554099	6831709	10
Wildlife Rehab Database	23/05/2013	0	49 Julian Rocks Rd, Byron Bay, NSW, 2481	557393	6832595	30
Wildlife Rehab Database	2/11/2013	0	5 Brookview Court, Ewingsdale, NSW, 2481	554579	6831256	30
Wildlife Rehab Database	21/02/2012	0	50 Julian Rocks Drive, Sunrise Beach, NSW, 2481	557474	6832538	30
Wildlife Rehab Database	15/03/2019	0	50 Skinners Shoot Road, Skinners Shoot, NSW, 2481	558718	6830911	10
Wildlife Rehab Database	22/04/2014	0	6 Jacaranda Drive, Byron Bay, NSW, 2481	557448	6832373	30
Wildlife Rehab Database	21/02/2015	0	6 Jacaranda Drive, Byron Bay, NSW, 2481	557448	6832373	30
Wildlife Rehab Database	4/09/2015	0	6 Jacaranda Place, Byron Bay, NSW, 2481	557448	6832373	30
Wildlife Rehab Database	1/06/2018	0	77 Parkway Drive, Ewingsdale, NSW, 2481	554290	6831637	10
Wildlife Rehab Database	13/11/2017	0	78 Sunrise Boulevard, Byron Bay, NSW, 2481	557616	6832238	10
Wildlife Rehab Database	4/02/2017	0	8/1 Belongil Cr, Byron Bay, NSW, 2481	557159	6832877	30

Source	Date	Number Koala Individuals	Details of record	Easting	Northing	Accuracy (metres)
Wildlife Rehab Database	5/11/2019	0	80 Sunrise Boulevarde, Byron Bay, NSW, 2481	557420	6832214	30
Wildlife Rehab Database	25/10/2019	0	81 Parkway Drive, Ewingsdale, NSW, 2481	554306	6831593	30
Wildlife Rehab Database	19/08/2012	0	82 Sunrise Blvd., Byron Bay, NSW, 2481	557656	6832204	30
Wildlife Rehab Database	15/09/2012	0	82 Sunrise Blvd., Byron Bay, NSW, 2481	557656	6832204	30
Wildlife Rehab Database	14/01/2012	0	9 Brookview Court, Ewingsdale, NSW, 2481	554575	6831261	30
Wildlife Rehab Database	30/10/2016	0	9 Plantation Dr, Ewingsdale, NSW, 2481	554298	6831241	30
Wildlife Rehab Database	13/10/2017	0	9-11 Brookview Ct, Ewingsdale, NSW, 2481	554596	6831250	10
Wildlife Rehab Database	11/10/2018	0	94 Sunrise Boulevard, Byron Bay, NSW, 2481	557764	6832183	10
Wildlife Rehab Database	6/09/2011	0	98 Parkway Drive, Ewingsdale, NSW, 2481	554265	6831430	30
Wildlife Rehab Database	12/10/2011	0	Bayshore Drive-near golf course, Byron Bay, NSW, 2481	557007	6832781	500
Wildlife Rehab Database	4/11/2011	0	Beach Resort-Bayshore Rd, Byron Bay, NSW, 2481	557385	6833308	250
Wildlife Rehab Database	9/11/2017	0	Belonjil Fields Caravan Park, Byron Bay, NSW, 2481	557829	6831985	10
Wildlife Rehab Database	9/10/2015	0	Buckleys Road, Tyagarah, NSW, 2481	554754	6835116	500
Wildlife Rehab Database	30/10/2014	0	Byron Farmers Marker-Butler St, Byron Bay, NSW, 2481	556256	6832224	500
Wildlife Rehab Database	26/04/2015	0	Cnr. Jacaranda Drive & Cypress Crt., Byron Bay, NSW, 2481	557532	6832123	50
Wildlife Rehab Database	23/09/2018	0	Currawong Way, Ewingsdale, NSW, 2481	554508	6830827	10
Wildlife Rehab Database	7/10/2018	0	Currawong Way, Ewingsdale, NSW, 2481	554508	6830827	10
Wildlife Rehab Database	7/10/2018	0	Currawong Way, Ewingsdale, NSW, 2481	554508	6830827	10
Wildlife Rehab Database	14/06/2017	0	Cypress Court, Sunrise, Byron Bay, NSW, 2481	557517	6832053	250
Wildlife Rehab Database	8/08/2019	0	Discovery Holiday Park Sunrise Boulevard, Byron Bay, NSW, 2481	557964	6832197	10
Wildlife Rehab Database	17/08/2018	1	Ewingsdale Rd, Byron Bay, NSW, 2481	556803	6831981	10
Wildlife Rehab Database	13/06/2012	0	Industrial Estate-Sunrise Blvd, Byron Bay, NSW, 2481	557865	6832236	500
Wildlife Rehab Database	22/02/2018	0	Plantation Drive, Ewingsdale, NSW, 2481	554068	6831290	10
Wildlife Rehab Database	22/02/2018	0	Plantation Drive, Ewingsdale, NSW, 2481	554068	6831290	10
Wildlife Rehab Database	22/08/2013	0	Sunrise Beach Estate-between Sunrise Blvd.&Cape Crt, Byron Bay, NSW, 2481	557172	6832565	100

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Appendix F – Updated Soil and Water Plans (MPC)

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NORTH

BASIN No.2 (WET BASIN)

PLAN AREA	≈65m²
SETTLING ZONE	≈43m³
STORAGE ZONE	≈21m³
BASIN VOLUME	≈64m³ (NOTE 1)
STORAGE VOLUME	≈56m³ (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.

EXISTING STP

MATCH LINE A

WATER DISCHARGED VIA THE PUMP-OUT LINE TO CONTAINMENT TRUCKS FOR DISPOSAL AT A SUITABLY LICENSED FACILITY.

EXISTING STP TANK

ACCESS CREST IN ROAD

EXISTING ACCESS TRACK

PUMP AND BACK-FLOW PREVENTION VALVE, TO BE DESIGNED BY A HYDRAULIC ENGINEER.

BASIN

WATER PUMP-OUT LINE, TO BE DESIGNED BY A HYDRAULIC ENGINEER

TEMPORARY DIVERSION SWALE

EXTENT OF 1% AEP TEMPORARY STORAGE. SURFACE AREA = 400m². SURFACE RL = 0.105m ABOVE TOP OF BASIN No.1 EMBANKMENT. STORED WATER CONTAINED BY PERIMETER EMBANKMENT. FULL DETAILS TBC AT CC DESIGN STAGE.

TEMPORARY DIVERSION SWALE

EXTENT OF 1% AEP TEMPORARY STORAGE. SURFACE AREA = 180m². SURFACE RL = 0.106m ABOVE TOP OF BASIN No.2 EMBANKMENT. STORED WATER CONTAINED BY PERIMETER EMBANKMENT. FULL DETAILS TBC AT CC DESIGN STAGE.

TEMPORARY EARTHWORKS EMBANKMENT & DIVERSION SWALE

PUMP AND BACK-FLOW PREVENTION VALVE, TO BE DESIGNED BY A HYDRAULIC ENGINEER.

BASIN

CLAY EMBANKMENT CONTAINMENT BUND, WITH SURFACE TREATMENT AS SPECIFIED IN THE ACID-SULPHATE MANAGEMENT PLAN

BUNDED ACID SULPHATE NEUTRALISATION PAD WITH SURFACE TREATMENT AS SPECIFIED IN THE ACID-SULPHATE MANAGEMENT PLAN. PLAN AREA = 500m² (10m x 50m)

CONTROLLED ENTRY / EXIT TO NEUTRALIZATION PAD FOR EARTHWORKS PLANT

EXISTING STP TANK

TEMPORARY DIVERSION SWALE

TEMPORARY EARTHWORKS EMBANKMENT & DIVERSION SWALE

ADMIN BUILDING

SURFACE FALL DIRECTION WITHIN THE ACID-SULPHATE NEUTRALIZATION PAD. 2% CROSS-FALL 1% LONGITUDINAL FALL TOWARDS THE LEACHATE DAM

BASIN No.1 (WET BASIN)

PLAN AREA	≈134m²
SETTLING ZONE	≈90m³
STORAGE ZONE	≈45m³
BASIN VOLUME	≈134m³ (NOTE 1)
STORAGE VOLUME	≈117m³ (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.

STABILIZED LEACHATE SWALE WITH SURFACE TREATMENT AS SPECIFIED IN THE ACID SULPHATE MANAMENT PLAN

TEMPORARY ACCESS ROAD, EARTHWORKS EMBANKMENT AND DIVERSION SWALE

PUMP AND BACK-FLOW PREVENTION VALVE, TO BE DESIGNED BY A HYDRAULIC ENGINEER

EXTENT OF 1% AEP TEMPORARY STORAGE. SURFACE AREA = 290m². SURFACE RL = 0.111m ABOVE TOP OF BASIN No.3 EMBANKMENT. STORED WATER CONTAINED BY PERIMETER EMBANKMENT. FULL DETAILS TBC AT CC DESIGN STAGE.

BASIN

BASIN No.3 (WET BASIN)

PLAN AREA	≈105m²
SETTLING ZONE	≈70m³
STORAGE ZONE	≈35m³
BASIN VOLUME	≈105m³ (NOTE 1)
STORAGE VOLUME	≈91m³ (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.

NOTE
BASINS TO BE PUMPED OUT TO CONTAINMENT TRUCKS AND REMOVED TO A SUITABLE LICENSED FACILITY.
DISCHARGED WATER MUST ALSO BE COMPLIANT WITH THE TARGET CRITERIA SPECIFIED IN THE ACID SULPHATE SOIL MANAGEMENT PLAN REPORT BY DOUGLAS PARTNERS: No.200486.02

REFER EARTH BASIN DETAIL SD6-4 FOR ALL TEMPORARY BASINS.
CONTRACTOR IS TO ADJUST THE BASIN SIZE AND SHAPE AS REQUIRED TO SUIT THE STATED BASIN VOLUMES AND SPECIFIED DETAILS. BATTER SHOWN INDICATIVELY ONLY

5 0 5 10 15
Horizontal Scale 1:250 (A1)
1:500 (A3)

PLANS TO BE PRINTED IN COLOUR

SOIL AND WATER MANAGEMENT PLAN SHEET 1

SCALE 1:250

SEDIMENTATION, EROSION CONTROL AND STORMWATER MANAGEMENT NOTES
1. REFER TO DRAWING C19 FOR NOTES AND LEGEND

ISSUE	REASON FOR ISSUE	DATE
6	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	15.10.2021
5	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	13.08.2021
4	ISSUED FOR COUNCIL APPROVAL - ESCP ADDED TO DA SET	21.05.2021
3	ISSUED FOR COUNCIL APPROVAL - DEVELOPMENT APPLICATION	10.05.2021
2	ISSUED FOR REVIEW AT 90%	30.04.2021
1	ISSUED FOR REVIEW AT 50%	28.04.2021
0	ISSUED FOR REVIEW AT 30%	20.04.2021

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CLIENT
BYRON SHIRE COUNCIL

TITLE
SOIL AND WATER MANAGEMENT PLAN
ACID SULPHATE MNGT - SHEET 1

PROJECT
BYRON BAY BIO-ENERGY FACILITY
45 WALLUM PLACE
BYRON BAY NSW

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
T.R.	B.C.	19	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	190178	C15	6

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

NOTE
BASINS TO BE PUMPED OUT TO CONTAINMENT TRUCKS AND REMOVED TO A SUITABLE LICENSED FACILITY.
DISCHARGED WATER MUST ALSO BE COMPLIANT WITH THE TARGET CRITERIA SPECIFIED IN THE ACID SULPHATE SOIL MANAGEMENT PLAN REPORT BY DOUGLAS PARTNERS: No.200486.02

REFER EARTH BASIN DETAIL SD6-4 FOR ALL TEMPORARY BASINS.
CONTRACTOR IS TO ADJUST THE BASIN SIZE AND SHAPE AS REQUIRED TO SUIT THE STATED BASIN VOLUMES AND SPECIFIED DETAILS. BATTER SHOWN INDICATIVELY ONLY

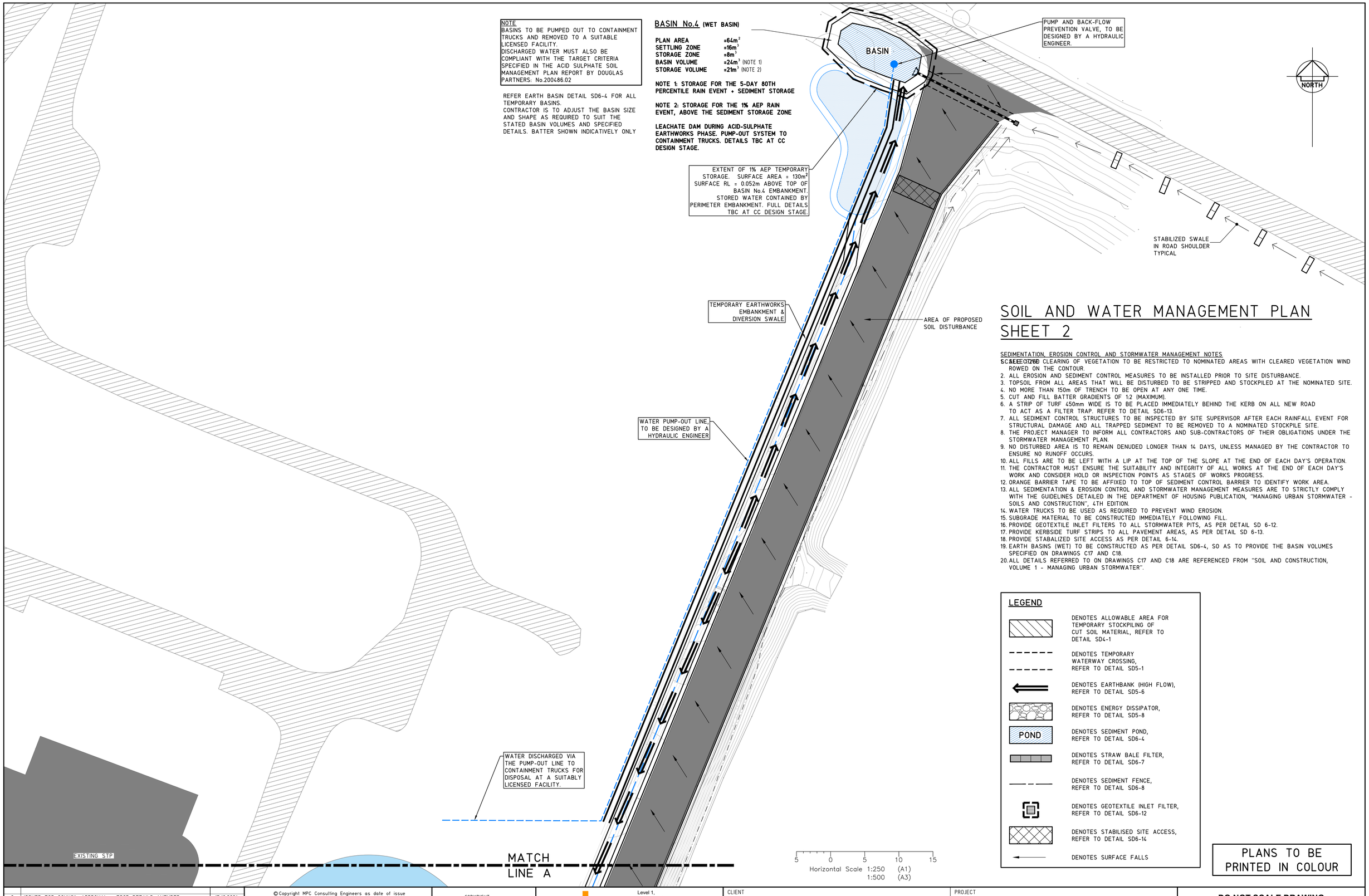
BASIN No.4 (WET BASIN)

PLAN AREA	**=64m²**
SETTLING ZONE	**=16m³**
STORAGE ZONE	**=8m³**
BASIN VOLUME	**=24m³** (NOTE 1)
STORAGE VOLUME	**=21m³** (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.



SOIL AND WATER MANAGEMENT PLAN SHEET 2

SEDIMENTATION, EROSION CONTROL AND STORMWATER MANAGEMENT NOTES

1. SCALE 1:250 CLEARING OF VEGETATION TO BE RESTRICTED TO NOMINATED AREAS WITH CLEARED VEGETATION WIND ROWED ON THE CONTOUR.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO SITE DISTURBANCE.
3. TOPSOIL FROM ALL AREAS THAT WILL BE DISTURBED TO BE STRIPPED AND STOCKPILED AT THE NOMINATED SITE.
4. NO MORE THAN 150m OF TRENCH TO BE OPEN AT ANY ONE TIME.
5. CUT AND FILL BATTER GRADIENTS OF 1:2 (MAXIMUM).
6. A STRIP OF TURF 450mm WIDE IS TO BE PLACED IMMEDIATELY BEHIND THE KERB ON ALL NEW ROAD TO ACT AS A FILTER TRAP. REFER TO DETAIL SD6-13.
7. ALL SEDIMENT CONTROL STRUCTURES TO BE INSPECTED BY SITE SUPERVISOR AFTER EACH RAINFALL EVENT FOR STRUCTURAL DAMAGE AND ALL TRAPPED SEDIMENT TO BE REMOVED TO A NOMINATED STOCKPILE SITE.
8. THE PROJECT MANAGER TO INFORM ALL CONTRACTORS AND SUB-CONTRACTORS OF THEIR OBLIGATIONS UNDER THE STORMWATER MANAGEMENT PLAN.
9. NO DISTURBED AREA IS TO REMAIN DENUDED LONGER THAN 14 DAYS, UNLESS MANAGED BY THE CONTRACTOR TO ENSURE NO RUNOFF OCCURS.
10. ALL FILLS ARE TO BE LEFT WITH A LIP AT THE TOP OF THE SLOPE AT THE END OF EACH DAY'S OPERATION.
11. THE CONTRACTOR MUST ENSURE THE SUITABILITY AND INTEGRITY OF ALL WORKS AT THE END OF EACH DAY'S WORK AND CONSIDER HOLD OR INSPECTION POINTS AS STAGES OF WORKS PROGRESS.
12. ORANGE BARRIER TAPE TO BE AFFIXED TO TOP OF SEDIMENT CONTROL BARRIER TO IDENTIFY WORK AREA.
13. ALL SEDIMENTATION & EROSION CONTROL AND STORMWATER MANAGEMENT MEASURES ARE TO STRICTLY COMPLY WITH THE GUIDELINES DETAILED IN THE DEPARTMENT OF HOUSING PUBLICATION, "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION", 4TH EDITION.
14. WATER TRUCKS TO BE USED AS REQUIRED TO PREVENT WIND EROSION.
15. SUBGRADE MATERIAL TO BE CONSTRUCTED IMMEDIATELY FOLLOWING FILL.
16. PROVIDE GEOTEXTILE INLET FILTERS TO ALL STORMWATER PITS, AS PER DETAIL SD 6-12.
17. PROVIDE KERBSIDE TURF STRIPS TO ALL PAVEMENT AREAS, AS PER DETAIL SD 6-13.
18. PROVIDE STABALIZED SITE ACCESS AS PER DETAIL 6-14.
19. EARTH BASINS (WET) TO BE CONSTRUCTED AS PER DETAIL SD6-4, SO AS TO PROVIDE THE BASIN VOLUMES SPECIFIED ON DRAWINGS C17 AND C18.
20. ALL DETAILS REFERRED TO ON DRAWINGS C17 AND C18 ARE REFERENCED FROM "SOIL AND CONSTRUCTION, VOLUME 1 - MANAGING URBAN STORMWATER".

LEGEND

- DENOTES ALLOWABLE AREA FOR TEMPORARY STOCKPILING OF CUT SOIL MATERIAL, REFER TO DETAIL SD4-1
- DENOTES TEMPORARY WATERWAY CROSSING, REFER TO DETAIL SD5-1
- DENOTES EARTHBANK (HIGH FLOW), REFER TO DETAIL SD5-6
- DENOTES ENERGY DISSIPATOR, REFER TO DETAIL SD5-8
- POND — DENOTES SEDIMENT POND, REFER TO DETAIL SD6-4
- DENOTES STRAW BALE FILTER, REFER TO DETAIL SD6-7
- DENOTES SEDIMENT FENCE, REFER TO DETAIL SD6-8
- DENOTES GEOTEXTILE INLET FILTER, REFER TO DETAIL SD6-12
- DENOTES STABILISED SITE ACCESS, REFER TO DETAIL SD6-14
- DENOTES SURFACE FALLS

PLANS TO BE PRINTED IN COLOUR

ISSUE	REASON FOR ISSUE	DATE
6	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	15.10.2021
5	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	13.08.2021
4	ISSUED FOR COUNCIL APPROVAL - ESCP ADDED TO DA SET	21.05.2021
3	ISSUED FOR COUNCIL APPROVAL - DEVELOPMENT APPLICATION	10.05.2021
2	ISSUED FOR REVIEW AT 90%	30.04.2021
1	ISSUED FOR REVIEW AT 50%	28.04.2021
0	ISSUED FOR REVIEW AT 30%	20.04.2021

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CLIENT
BYRON SHIRE COUNCIL

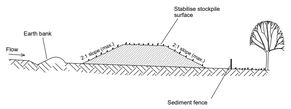
TITLE
SOIL AND WATER MANAGEMENT PLAN
ACID SULPHATE MNGT - SHEET 2

PROJECT
BYRON BAY BIO-ENERGY FACILITY
45 WALLUM PLACE
BYRON BAY NSW

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
T.R.	B.C.	19	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	190178	C16	6

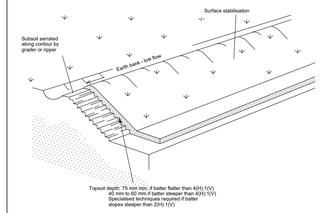
FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

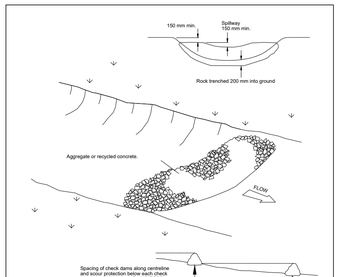
STOCKPILES SD 4-1



Construction Notes

1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

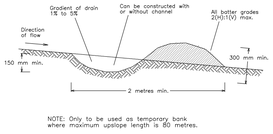
REPLACING TOPSOIL SD 4-2



Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

ROCK CHECK DAM SD 5-4

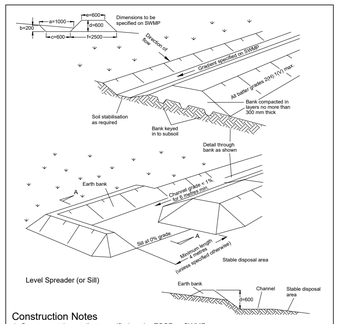


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

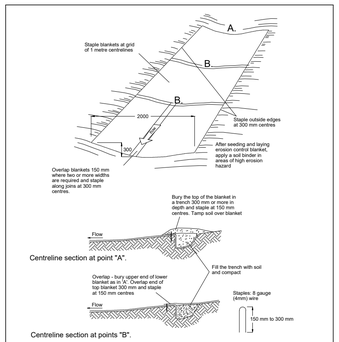
EARTH BANK (LOW FLOW) SD 5-5



Construction Notes

1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

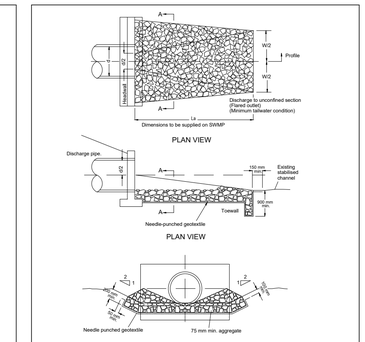
EARTH BANK (HIGH FLOWS) SD 5-6



Construction Notes

1. Remove any rocks, clods, sticks or grass from the surface before laying matting
2. Ensure that topsoil is at least 75 mm deep.
3. Complete fertilising and seeding before laying the matting.
4. Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.
5. Lay the fabric in "shingle-fashion", with the end of each upstream roll overlapping those downstream. Ensure each roll is anchored properly at its upslope end.
6. Ensure that the full width of flow in the channel is covered by the matting up to the design storm event, usually in the 10-year ARI time of concentration storm event.
7. Divert water from the structure until vegetation is stabilised properly.

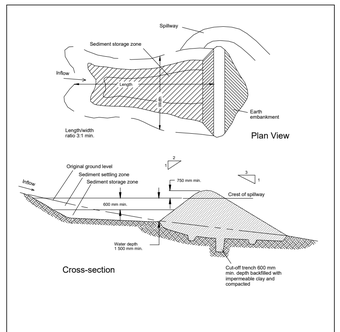
RECP : CONCENTRATED FLOW SD 5-7



Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

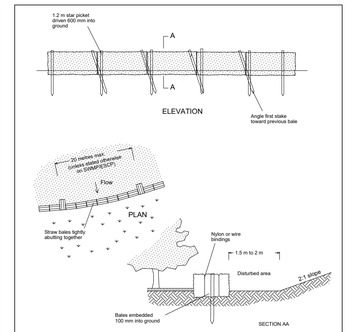
ENERGY DISSIPATER SD 5-8



Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

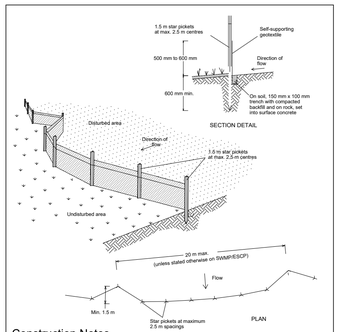
EARTH BASIN - WET SD 6-4
(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)



Construction Notes

1. Construct the straw bale filter as close as possible to being parallel to the contours of the site.
2. Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws are to be placed parallel to ground.
3. Ensure that the maximum height of the filter is one bale.
4. Embed each bale in the ground 75 mm to 100 mm and anchor with two 1.2 metre star pickets or stakes. Angle the first star picket or stake in each bale towards the previously laid bale. Drive them 600 mm into the ground and, if possible, flush with the top of the bales. Where star pickets are used and they protrude above the bales, ensure they are fitted with safety caps.
5. Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1 to 2 metres downslope from the toe.
6. Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.

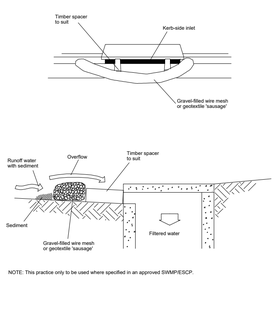
STRAW BALE FILTER SD 6-7



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE SD 6-8

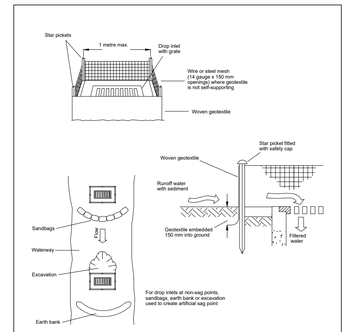


NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

1. Install filters to kerb inlets only at sag points.
2. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit and fill it with 25 mm to 50 mm gravel.
3. Form an elliptical cross-section about 150 mm high x 400 mm wide.
4. Place the filter at the opening leaving at least a 100-mm space between it and the kerb inlet. Maintain the opening with spacer blocks.
5. Form a seal with the kerb to prevent sediment bypassing the filter.
6. Sandbags filled with gravel can substitute for the mesh or geotextile providing they are placed so that they firmly abut each other and sediment-laden waters cannot pass between.

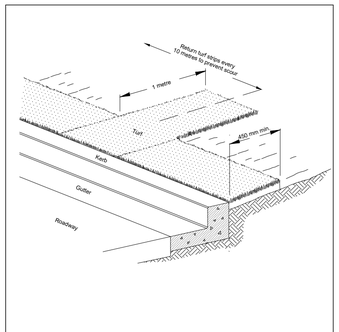
MESH AND GRAVEL INLET FILTER SD 6-11



Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.

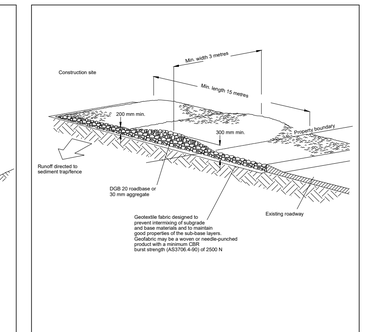
GEOTEXTILE INLET FILTER SD 6-12



Construction Notes

1. Install a 450 mm minimum wide roll of turf on the footpath next to the kerb and at the same level as the top of the kerb.
2. Lay 1.4 metre long turf strips normal to the kerb every 10 metres.
3. Rehabilitate disturbed soil behind the turf strip following the ESCP/SWMP.

KERBSIDE TURF STRIP SD 6-13



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200 mm thick pad over the geotextile using road base or 30 mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS SD 6-14

SOIL AND WATER MANAGEMENT DETAILS

EROSION AND SEDIMENTATION CONTROL NOTES:
The following notes may not be relevant to each development.

GENERAL

1 ESCP refers to Erosion and Sediment Control Plan or a Soil and Water Management Plan (SWMP).
2 ESC refers to erosion and sediment control.
3 Sediment, includes, but is not limited to, clay, silt, sand, gravel, soil, mud, cement, and ceramic waste.
4 Any reference to the Blue Book refers to Managing Urban Stormwater – Soils and Construction. Landcom, 2004.
5 Any reference to the IECA White Books (2008) refers to IECA 2008. Best Practice Erosion and Sediment Control. Books 1–6.International Erosion Control Association (Australasia). Picton NSW.
6 Any material deposited in any conservation area from works associated with the development shall be removed immediately by measures involving minimal ground and/or vegetation disturbance and no machinery, or following directions by Council and/or within a timeframe advised by Council.

THE ESCP

7 The ESCP and its associated ESC measures shall be constantly monitored, reviewed, and modified as required to correct deficiencies. Council has the right to direct changes if, in its opinion, the measures that are proposed or have been installed are inadequate to prevent pollution.
8 Prior to any activities onsite, the responsible person(s) is to be nominated. The responsible person(s) shall be responsible for the ESC measures onsite. The name, address and 24 hour contact details of the person(s) shall be provided to Council in writing. Council shall be advised within 48 hours of any changes to the responsible person(s), or their contact details, in writing.
9 At least 14 days before the natural surface is disturbed in any new stage, the contractor shall submit to the Certifier, a plan showing ESC measures for that Stage. The degree of design detail shall be based on the disturbed area.
10 At any time during construction, the ESC measures onsite shall be appropriate for the area of disturbance and its characteristics including soils (in accordance with those required for the site as per DCP).
11 The implementation of the ESCP shall be supervised by personnel with appropriate qualifications and/or experience in ESC on construction sites.
12 The approved ESCP shall be available on-site for inspection by Council officers while work activities are occurring.
13 The approved ESCP shall be up to date and show a timeline of installation, maintenance and removal of ESC measures.
14 All ESC measures shall be appropriate for the Sediment Type(s) of the soils onsite, in accordance with the Blue Book, IECA White Books or other current recognised industry standard for ESC for Australian conditions.
15 Adequate site data, including soil data from a NATA approved Laboratory, shall be obtained to allow the preparation of an appropriate ESCP, and allow the selection, design and specification of required ESC measures.
16 All works shall be carried out in accordance with the approved ESCP (as amended from time to time) unless circumstances arise where:
 a) compliance with the ESCP would increase the potential for environmental harm; or
 b) circumstances change during construction and those circumstances could not have been foreseen; or
 c) Council determines that unacceptable off-site sedimentation is occurring as a result of a land-disturbing activity. In either case, the person(s) responsible may be required to take additional, or alternative protective action, and/or undertake reasonable restoration works within the timeframe specified by the Council.
17 Additional ESC measures shall be implemented, and a revised ESCP submitted for approval to the certifier (within five business days of any such amendments) in the event that:
 a) there is a high probability that serious or material environmental harm may occur as a result of sediment leaving the site; or
 b) the implemented works fail to achieve Council's water quality objectives specified in these conditions; or
 c) site conditions significantly change; or
 d) site inspections indicate that the implemented works are failing to achieve the 'objective' of the ESCP.
18 A copy of any amended ESCP shall be forwarded to an appropriate Council Officer, within five business days of any such amendments.

SITE ESTABLISHMENT INCLUDING CLEARING AND MULCHING

19 No land clearing shall be undertaken unless preceded by the installation of adequate drainage and sediment control measures, unless such clearing is required for the purpose of installing such measures, in which case, only the minimum clearing required to install such measures shall occur.
20 Bulk tree clearing and grubbing of the site shall be immediately followed by specified temporary erosion control measures (e.g. temporary grassing or mulching) prior to commencement of each stage of construction works.
21 Trees and vegetation cleared from the site shall be mulched onsite within 7 days of clearing.
22 Appropriate measures shall be undertaken to control any dust originating due to the mulching of vegetation onsite.
23 All office facilities and operational activities shall be located such that any effluent, including wash-down water, can be totally contained and treated within the site.
24 All reasonable and practicable measures shall be taken to ensure stormwater runoff from access roads and stabilised entry/exit systems, drains to an appropriate sediment control device.
25 Site exit points shall be appropriately managed to minimise the risk of sediment being tracked onto sealed, public roadways.
26 Stormwater runoff from access roads and stabilised entry/exit points shall drain to an appropriate sediment control device.
27 The Applicant shall ensure an adequate supply of ESC, and appropriate pollution clean-up materials are available on-site at all times.
28 All temporary earth banks, flow diversion systems, and sediment basin embankments shall be machine-compacted, seeded and mulched within ten (10) days of formation for the purpose of establishing a vegetative cover, or lined appropriately.
29 Sediment deposited off site as a result of on-site activities shall be collected and the area cleaned/rehabilitated as soon as reasonable and practicable.
30 Concrete waste and chemical products, including petroleum and oil-based products, shall be prevented from entering any internal or external water body, or any external drainage system, excluding those on-site water bodies specifically designed to contain and/or treat such material. Appropriate measures shall be installed to trap these materials onsite.
31 Brick, tile or masonry cutting shall be carried out on a pervious surface (e.g. grass or open soil) and in such a manner that any resulting sediment-laden runoff is prevented from discharging into a gutter, drain or water. Appropriate measures shall be installed to trap these materials onsite.
32 Newly sealed hard-stand areas (e.g. roads, driveways and car parks) shall be swept thoroughly as soon as practicable after sealing/surfacing to minimise the risk of components of the surfacing compound entering stormwater drains.
33 Stockpiles of erodible material shall be provided with an appropriate protective cover (synthetic or organic) if the materials are likely to be stockpiled for more than 10 days.
34 Stockpiles, temporary or permanent, shall not be located in areas identified as no-go zones (including, but not limited to, restricted access areas, buffer zones, or areas of non-disturbance) on the ESCP.
35 No more than 150m of a stormwater, sewer line or other service trench shall to be open at any one time.
36 Site spoil shall be lawfully disposed of in a manner that does not result in ongoing soil erosion or environmental harm.
37 Wherever reasonable and practicable, stormwater runoff entering the site from external areas, and non-sediment laden (clean) stormwater runoff entering a work area or area of soil disturbance, shall be diverted around or through that area in a manner that minimises soil erosion and the contamination of that water for all discharges up to the specified design storm discharge.

SITE MANAGEMENT INCLUDING DUST

38 Priority shall be given to the prevention, or at least the minimisation, of soil erosion, rather than the trapping of displaced sediment. Such a clause shall not reduce the responsibility to apply and maintain, at all times, all necessary ESC measures.
39 Measures used to control wind erosion shall be appropriate for the location and prevent soil erosion at all times, including working hours, out of hours, weekends, public holidays and during any other shutdown periods.
40 The application of liquid or chemical-based dust suppression measures shall ensure that sediment-laden runoff resulting from such measures does not create a traffic or environmental hazard.
41 All cut and fill earth batters less than 3m in elevation shall be topsoiled, and grass seeded/hydromulched within 10 days of completion of grading in consultation with Council.
42 Once cut/fill operations have been finalised in a section, all disturbed areas that are not being worked on shall be stabilised in accordance with the times in the Blue Book.
43 All reasonable and practicable measures shall be taken to prevent, or at least minimise, the release of sediment from the site.
44 Suitable all-weather maintenance access shall be provided to all sediment control devices.
45 Sediment control devices, other than sediment basins, shall be de-silted and made fully operational as soon as reasonable and practicable after a sediment-producing event, whether natural or artificial, if the device's sediment retention capacity falls below 75% of its design retention capacity.
46 All erosion and sediment control measures, including drainage control measures, shall be maintained in proper working order at all times during their operational lives.
47 Washing/flushing of sealed roadways shall only occur where sweeping has failed to remove sufficient sediment and there is a compelling need to remove the remaining sediment (e.g. for safety reasons). In such circumstances, all reasonable and practicable sediment control measures shall be used to prevent, or at least minimise, the release of sediment into receiving waters. Only those measures that will not cause safety and property flooding issues shall be employed. Sediment removed from roadways shall be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.
48 Sediment removed from sediment traps and places of sediment deposition shall be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.

SEDIMENT BASINS – INSTALLATION, MAINTENANCE AND REMOVAL INCLUDING SEDIMENT TRAPS

49 As-Constructed plans shall be prepared for all constructed Sediment Basins and associated emergency spillways. Such plans shall verify the basin's dimensions, levels and volumes comply with the approved design drawings. These plans may be requested by the Certifier or Council.
50 Sediment basins shall be constructed and fully operational prior to any other soil disturbance in their catchment.
51 Install an internal gated valve, or similar, in any outlet pipe once pipes installed, or install a sacrificial pipe from basin through wall to external outlet point. The valve shall be connected to a riser made from slotted pipe in the basin. The valve may be opened once captured water meets water quality requirements. The final setup for temporary internal outlet structures to be confirmed prior to construction with Council. This setup will enable discharge of treated water from site without need for pumping.
52 A sediment storage level marker post shall be with a cross member set just below the top of the sediment storage zone (as specified on the approved ESCP). At least a 75mm wide post shall be firmly set into the basin floor.
53 The Site Manager shall obtain the relevant approvals from the relevant organisations to discharge treated water from any existing basins. Organisations may include, but not be limited to, Hunter Water, and Council.
54 Where more than one stage is to be developed at one time, or before the preceding stage is complete, the sediment basin(s) for these stages shall have sufficient capacity to cater for all area directed to the basin(s).
55 Prior to any forecast weather event likely to result in runoff, any basins/traps shall be dewatered to provide sufficient capacity to capture sediment laden water from the site.
56 Sufficient quantities of chemicals/agents to treat captured water shall be placed such that water entering the basin mixes with the chemical/agents and is carried into the basin to speed up clarification.
57 Any basin shall be dewatered within the X-day rainfall depth used to calculate the capacity of the basin, after a rainfall event.
58 Sufficient quantities of chemicals/agents to treat turbid water shall be securely stored on-site to provide for at least three complete treatments of all basins requiring chemically treatment onsite.

SEDIMENT BASINS – INSTALLATION, MAINTENANCE AND REMOVAL INCLUDING SEDIMENT TRAPS CONT'D

59 Prior to the controlled discharge (e.g. de-watering activities) from excavations and/or sediment basins, the water quality objectives shall be achieved as specified in the Acid Sulphate Soil Management Plan prepared by Douglas Partners (Project 200486.02)
60 The Development Approval may require testing of additional water quality elements prior to discharge. E.g. heavy metals.
61 A sample of the released treated water shall be kept onsite in a clear container with the sample date recorded on it.
62 Water quality samples shall be taken at a depth no less than 200mm below the water surface of the basin.
63 No Aluminium based products may be used treat captured water onsite without the prior written permission from an appropriate Council Officer. The applicant shall have a demonstrated ability to use such products correctly and without environmental harm prior to any approval.
64 The chemical/agent used in Type D and Type F basins to treat captured water captured in the basin shall be applied in concentrations sufficient to achieve Council's water quality objectives within the X-day rainfall depth used to calculate the capacity of the basin, after a rainfall event.
65 All Manufacturers' Instructions shall be followed for any chemicals/agents used onsite, except where approved by the Responsible Person or an appropriate Council Officer.
66 The Applicant shall ensure that on each occasion a Type F or Type D basin was not de-watered prior to being surcharged by a following rainfall event, a report is presented to an appropriate Council officer within 5 days identifying the circumstances and proposed amendments, if any, to the basin's operating procedures.
67 Settled sediment shall be removed as soon as reasonable and practicable from any sediment basin if:
 a) it is anticipated that the next storm event is likely to cause sediment to settle above the basin's sediment storage zone; or
 b) the elevation of settled sediment is above the top of the basin's sediment storage zone; or
 c) the elevation of settled sediment is above the basins sediment marker line.
68 Scour protection measures placed on sediment basin emergency spillways shall appropriately protect the spillway chute and its side batters from scour, and shall extend a minimum of 3m beyond the downstream toe of the basin's embankment.
69 Suitable all-weather maintenance access shall be provided to all sediment control devices.
70 Materials, whether liquid or solid, removed from any ESC measures during maintenance or decommissioning, shall be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.
71 All sediment basins shall remain fully operational at all times until the basin's design catchment achieves 70% ground cover or surface stabilisation acceptable to Council.
72 The ESC measures installed during the decommissioning and rehabilitation of a sediment basin shall comply with same standards specified for the normal construction works.
73 A sediment basin shall not be decommissioned until all up-slope site stabilisation measures have been implemented and are appropriately working to control soil erosion and sediment runoff..
74 Immediately prior to the construction of the permanent stormwater treatment device, appropriate flow bypass conditions shall be established to prevent sediment-laden water entering the device.

REVEGETATION/STABILISATION

75 Temporary Stabilisation may be attained using vegetation, non rewettable soil polymers, or pneumatically applied erosion controls.
76 All cut and fill earth batters less than 3m in elevation shall be topsoiled, and grass seeded/hydromulched within 10 days of completion of grading in consultation with Council.
77 Once cut/fill operations have been finalised in a section, all disturbed areas that are not being worked on shall be stabilised in accordance with time lines in the Blue Book.
78 The LMCC Seed mix shall be used unless stated on the ESCP/SWMP.
79 The pH level of topsoil shall be appropriate to enable establishment and growth of specified vegetation prior to initiating the establishment of vegetation.
80 Non rewettable binder shall be used in all hydromulch/hydroseed/polymer mixes on slopes or works adjacent to a water course.
81 Soil ameliorants shall be added to the soil in accordance with an approved Landscape Plan, Vegetation Management Plan, and/or soil analysis.
82 Surface soil density, compaction and surface roughness shall be adjusted prior to seeding/planting in accordance with an approved Landscape Plan, Vegetation Management Plan, and/or soil analysis.
83 Procedures for initiating a site shutdown, whether programmed or un-programmed, shall incorporate revegetation of all soil disturbances unless otherwise approved by Council. The stabilisation works shall not rely upon the longevity of non-vegetated erosion control blankets, or temporary soil binders.

SITE MONITORING AND MAINTENANCE

84 The Applicant shall ensure that appropriate procedures and suitably qualified personnel are engaged to plan and conduct site inspections and water quality monitoring throughout the construction and maintenance phase.
85 All ESC measures shall be inspected and any maintenance undertaken immediately:
 a) at least daily (when work is occurring on-site); and
 b) at least weekly (when work is not occurring on-site); and
 c) within 24hrs of expected rainfall; and
 d) within 18hrs of a rainfall event that causes runoff on the site.
86 Written records shall be kept onsite of ESC monitoring and maintenance activities conducted during the construction and maintenance periods, and be available to Council officers on request.
87 All environmentally relevant incidents shall be recorded in a field log that shall remain accessible to all relevant regulatory authorities.
88 All water quality data, including dates of rainfall, dates of testing, testing results and dates of water release, shall be kept in an on-site register. The register is to be maintained up to date for the duration of the approved works and be available on-site for inspection by [insert name of regulatory authority] on request.
89 At nominated instream water monitoring sites, a minimum of 3 water samples shall be taken and analysed, and the average result used to determine quality.

INSTREAM WORKS

90 All instream works (including in or adjacent to watercourses natural or manmade, flowing or not) shall be carried out in accordance with the IECA White Books.

NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
6	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	15.10.2021
5	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	13.08.2021
4	ISSUED FOR COUNCIL APPROVAL - ESCP ADDED TO DA SET	21.05.2021
3	ISSUED FOR COUNCIL APPROVAL - DEVELOPMENT APPLICATION	10.05.2021
2	ISSUED FOR REVIEW AT 90%	30.04.2021
1	ISSUED FOR REVIEW AT 50%	28.04.2021
0	ISSUED FOR REVIEW AT 30%	20.04.2021

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CLIENT
BYRON SHIRE COUNCIL

TITLE
SOIL AND WATER MANAGEMENT DETAILS

PROJECT
BYRON BAY BIO-ENERGY FACILITY
45 WALLUM PLACE
BYRON BAY NSW

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
T.R.	B.C.	19	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	190178	C17	6

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

Project: Byron Bay Bioenergy Facility
Job No: 190178
Subject: Soil and Water Management Plan - storage volumes for 1% AEP storm events
Date: 15.10.2021

1% AEP Rainfall Event - On-site temporary stormwater storage volumes

Basin / Catchment No.	Area (ha)	tc (mins)	Rainfall intensity, I, mm/hr	C_{10}	FFy	Q (peak) m^3 / s	Storage Volume m^3
1	0.438	5	282	0.95	1.2	0.391	117
2	0.21	5	282	0.95	1.2	0.188	56
3	0.341	5	282	0.95	1.2	0.305	91
4	0.078	5	282	0.95	1.2	0.070	21

Notes.

1. Volumes calculated are based on containing 100% of the rainfall on site. No flows will be released to the downstream catchment.
2. The 1% AEP storage volumes exceed the volume of the "settling zone" for each basin. In the 1% AEP event the stored water will extend beyond the plan footprint of the individual basins, but will still be contained by the perimeter embankment around the site.

SWMP Commentary, Standard Calculation

Note: These "Standard Calculation" spreadsheets relate only to low erosion hazard lands as identified in figure 4.6 where the designer chooses to not use the RUSLE to size sediment basins. The more "Detailed Calculation" spreadsheets should be used on high erosion hazard lands as identified by figure 4.6 or where the designer chooses to run the RUSLE in calculations.

1. Site Data Sheet

Site name: **Byron Bay Bio Energy Plant**

Site location: **Byron Bay Sewer Treatment facility**

Precinct: **Byron Bay, NSW**

Description of site: **Bio Energy Plant, hardstand, access road and car park**

Site area	Site						Remarks
	1	2	3	4			
Total catchment area (ha)	0.438	0.21	0.341	0.078			
Disturbed catchment area (ha)	0.438	0.1	0.341	0.078			

Soil analysis

Soil landscape	Sloping Site - Silty Clay Soils						DIPNR mapping (if relevant)
Soil Texture Group	Type F	Type F	Type F	Type F			Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	5	5	5	5			See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	80	80	80	80			See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	48.5	48.5	48.5	48.5			See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	13	13	13	13			See IFD chart for the site
Rainfall erosivity (R-factor)	3660	3660	3660	3660			Automatic calculation from above data

Comments: 80th percentile rainfall depth allows for period of soil disturbance for up to 6 months with sensitive downstream catchment.

2. Storm Flow Calculations

Peak flow is given by the Rational Formula:

$$Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,\,tc} \times A$$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years. Rural runoff coefficients are given in Volume 2, figure 5 of Pilgrim (1998), while urban runoff coefficients are given in Volume 1, Book VIII, figure 1.13 of Pilgrim (1998) and construction runoff coefficients are given in Appendix F
- F_y is a frequency factor for "Y" years. Rural values are given in Volume 1, Book IV, Table 1.1 of Pilgrim (1998) while urban coefficients are given in Volume 1, Book VIII, Table 1.6 of Pilgrim (1998)
- A is the catchment area in hectares (ha)
- $I_{y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs (Volume 1, Book IV of Pilgrim, 1998)

Note: For urban catchments the time of concentration should be determined by more precise calculations or reduced by a factor of 50 per cent.

Peak flow calculations, 1

Site	A (ha)	tc (mins)	Rainfall intensity, I, mm/hr						C_{10}
			$1_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
1	0.438	6	75	117	130	147	170	187	0.95
2	0.21	4	75	117	130	147	170	187	0.95
3	0.341	5	75	117	130	147	170	187	0.95
4	0.078	3	75	117	130	147	170	187	0.95

Peak flow calculations, 2

ARI yrs	Frequency factor (F_y)	Peak flows						Comment
		1	2	3	4			
		(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m3/s)	
$1_{yr,\,tc}$	0.8	0.069	0.033	0.054	0.012			
$5_{yr,\,tc}$	0.95	0.129	0.062	0.100	0.023			
$10_{yr,\,tc}$	1	0.150	0.072	0.117	0.027			
$20_{yr,\,tc}$	1.05	0.179	0.086	0.139	0.032			
$50_{yr,\,tc}$	1.15	0.226	0.108	0.176	0.040			
$100_{yr,\,tc}$	1.2	0.260	0.124	0.202	0.046			

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{y\text{-}\%ile,\ x\text{-}day} \ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1	0.42	48.5	0.438	89.2206	45	133.8309
2	0.42	48.5	0.21	42.777	21	64.1655
3	0.42	48.5	0.341	69.4617	35	104.19255
4	0.42	48.5	0.078	15.8886	8	23.8329

Appendix G – Updated Acid Sulfate Soil Management Plan

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Integrated Practical Solutions

Report on
Acid Sulfate Soil Management Plan

Proposed Bioenergy Facility
45 Wallum Place, Byron Bay

Prepared for
Skala Australasia Pty Ltd

Project 200486.02
October 2021

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	200486.02	Document No.	00.R.001 Skala
Document title	Report on Acid Sulfate Soil Management Plan Proposed Bioenergy Facility		
Site address	45 Wallum Place, Byron Bay		
Report prepared for	Skala Australasia Pty Ltd		
File name	200486.02.00.R.001 Skala		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Gary Samuels	Andrew Middleton	1 June 2021
Revision 1	Gary Samuels		30 August 2021
Revision 2	Gary Samuels		8 October 2021

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0			Simon, Skala Australia Pty Ltd
Revision 1			Angus Johnston, Jackon Environmental and Planning
			Erik Larson, Jackson Environmental and Planning

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

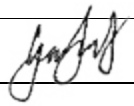
	Signature	Date
Author		8 October 2021
Reviewer		8 October 2021

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Table of Contents

Report on Acid Sulfate Soil Management Plan
Proposed Bioenergy Facility
45 Wallum Place, Byron Bay

1. Introduction

This report presents the results of an acid sulfate soil management plan (ASSMP) prepared by Douglas Partners Pty Ltd (DP) for the proposed Bioenergy Facility at 45 Wallum Place, Byron Bay. The investigation was carried out at the request of Jackson Environment and Planning Pty Ltd (project environmental consultant) in accordance with DP's email fee proposal dated 19 May 2021.

The proposed development will be located adjacent to the existing Byron Bay Sewerage Treatment Plant (BBSTP). The development will include proven enclosed anaerobic digestion technologies, including up to six tunnel digestors, some of which may also have the capability to aerobically compost the organic wastes received. Other major components of the BEF will include:

- A site administration building with offices, control room, education room and staff/visitors amenities;
- Enclosed waste receival hall, including product dispatch area, under negative pressure and including fast open and close roller doors;
- A biofilter for treatment of air from the enclosed waste receival hall and tunnels;
- Flexible biogas storage tank;
- Concrete percolate storage tank;
- Biogas treatment system; and
- Combined heat and power (CHP) system (250kW) and flare.

It is understood that cut and fill of up to 2 m may occur across the site. It is further understood that no water will be discharged from site but will be collected on site in a series of HDPE lined dams which are to be pumped out to a containment trucks and removed to a suitably licenced facility, as required.

Douglas Partners Pty Ltd has previously carried out a preliminary geotechnical investigation and acid sulfate soil assessment of this site and these results are provided in a report titled '*Report on Preliminary Geotechnical Investigation and Acid Sulfate Soil Assessment, Proposed Bioenergy Facility, 45 Wallum Place, Byron Bay',* Project 20486.00 dated March 2021. The borehole logs and site plan from the previous investigation are appended to this report for reference. Issues relating to site description, regional geology and acid sulfate soil map information, and recommendations are described in the above report and as such this acid sulfate soil management plan (ASSMP) must be read in conjunction with this previous report. Further, this report must also be read in conjunction with the notes 'About this Report' in Appendix A.

The results of the above referenced investigation indicated that the site contained ASS within proposed excavation depths and therefore an ASSMP was required.

2. Previous Field Work Results

The subsurface conditions encountered at each bore are given in detail on the borehole logs in Appendix C. These must be read in conjunction with, the notes '*About this Report'* and other explanatory notes provided in Appendix A, which define the sampling methods, soil and rock descriptions and symbols and abbreviations used in its preparation.

The subsurface conditions encountered at the bore are summarised in Table 1 and shown graphically as Figure 1.

In summary, the ground conditions encountered in the bores comprised uncontrolled fill over alluvial firm to stiff silt then medium dense sand to borehole termination depths. The fill was varied from appearing poorly compacted to well compacted, and in the absence of any compaction control documentation, the fill encountered on site must be deemed 'uncontrolled fill'. Some cobbles were noted in the fill in part.

Table 1: Summary of Subsurface Conditions

Bore	Strata/Depth Range[i]			
	Uncontrolled Fill Silt/Sand/Clay/Gravel Mix	Sandy Silt - firm to stiff	Sand – medium dense (or denser)	Groundwater
1	0.0 – 1.2	1.2 – 1.9	1.9 – 3.0	2.5
2	0.0 – 1.2[ii]	-	-	NE
3	0.0 – 1.45	-	1.45 – 5.0	NE
4	0.0 – 0.9	0.9 – 1.5	-	NE
6	0.0 – 1.2	-	1.2 – 6.0	0.85
7	0.0 – 1.4[ii]	-	-	NE
8	0.0 – 1.6	-	1.6 – 6.0	1.4
9	0.0 – 2.4	-	2.4 – 6.4	2.9
10	0.0 – 1.9	1.9 – 2.4	2.4 – 6.0	2.1
11	0.0 – 1.4	-	1.4 – 6.0	1.1
12	0.0 – 0.4	-	0.4 – 6.0	0.95
13	0.0 – 1.5	-	1.5 – 3.45	1.25
15	0.0 – 1.2	-	1.2 – 1.5	1.3

Note i) All above depths were measured from existing site level at the time of the investigation
ii) TC Bit refusal on obstruction in fill
iii) NE – Not Encountered with drilled depth limit.

Groundwater was encountered in Bores 1, 6, and 8 to 14 at the depths indicated above in Table 1. The site is affected by tidal action so variations in groundwater levels should be expected. Further, groundwater depths are affected by climatic conditions, surface and subsurface drainage conditions and human influences, and will therefore vary with time.

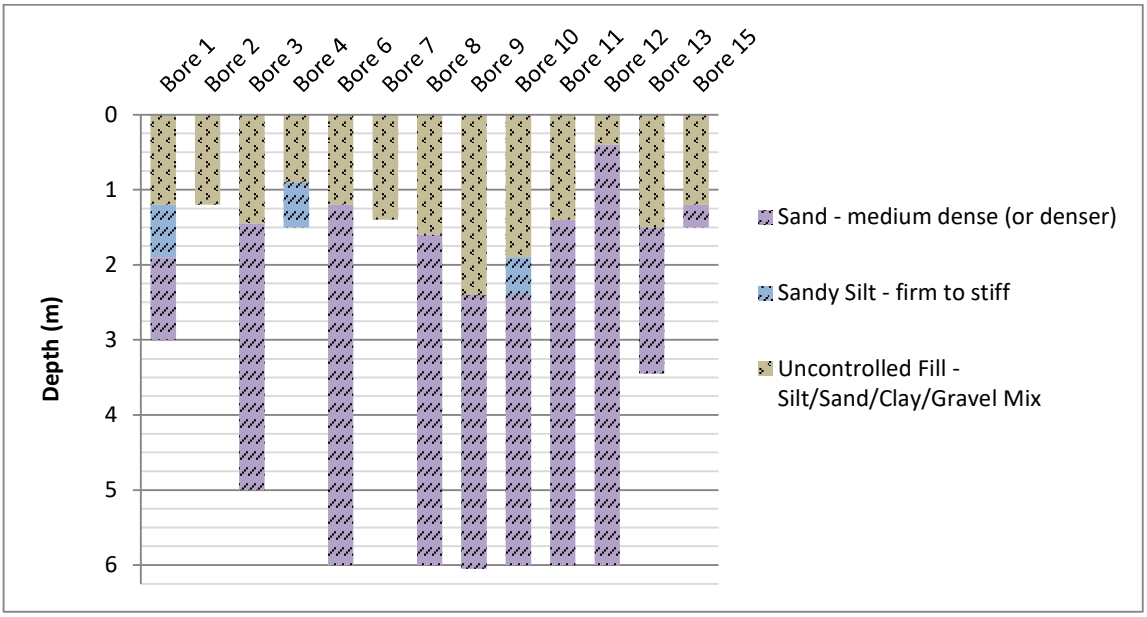

Figure 1: Graphical Summary of Subsurface Conditions

3. Previous Laboratory Testing

In order to assess the presence or otherwise of ASS, field screening and chemical laboratory tests for ASS were carried out as per ASSMAC guidelines 1998 (NSW). In total, 16 samples recovered from the bores were screened by measurement of pH after the addition of distilled water (pH_F) and peroxide (pH_{FOX}).

Based on the results of the screening tests and visual inspection of the samples, eight samples were submitted for more rigorous Chromium Suite analytical testing. Results of the screening tests (pH_F and pH_{FOX}) and Chromium Suite tests are presented in Table 2 in Appendix D, along with the detailed laboratory report sheets. It should be noted that Chromium Suite Testing was conducted on the predominant soil types encountered during the investigation.

4. ASS Management Plan

The existing fill and natural soil at the site contain levels of potential acidity that will require treatment if disturbed during development.

4.1 Risk Categorisation

All excavations in the soils on this site are to be considered as disturbance of PASS and are to be managed accordingly. For the purpose of this assessment, it is expected that greater than 1000 t of PASS will be disturbed.

On the basis, the proposed development would be classified as requiring a Category H to VH (high to very high) level of treatment due to the anticipated relatively small quantity of PASS disturbance expected (≥1000 t) and the maximum potential acidity identified (S_{Cr} of 0.03 %S). Category H to VH sites require neutralisation, monitoring, and bunding of all excavated PASS, as well as management of water during site works.

4.2 Management Strategy – Neutralisation

All materials to be excavated on site have the potential to contain PASS and will require neutralisation. Neutralisation aims to mitigate or manage the generation of acid from pyritic materials in the soil by minimising their oxidation when exposed to aerobic conditions. Neutralisation is best achieved by addition of powdered agricultural lime (ag lime) and sufficient mixing to form a homogeneous mixture.

Where neutralisation is to be undertaken, the process must be managed in a controlled environment such as a bunded and lined treatment pad with perimeter drainage constructed to control runoff, and a sump for the collection of water. This enables collection and treatment of any acidic leachate formed during the soil drying and liming process. As treatment pads are typically constructed in open site areas, any stormwater runoff must be contained within the bunded area.

It should be noted that saturated soil cannot be neutralised effectively with lime, particularly when the soil is cohesive, i.e. contains a large percentage of silt or clay sized particles. The lime and soil must be well mixed for neutralisation to occur, and the mixing process is not effective when the soil is wet and 'sticky'. The material should be dried, then mixed with lime by way of tyning.

All water draining from the spoil after excavation should be considered as potentially acidic and shall be contained within a controlled area such as a bunded treatment pad. Any rainwater or groundwater entering excavations should also be considered potentially acidic and be contained within the treatment pad. All water captured and leachate generated from the treatment pad will be collected in the proposed site dams and pumped out to a containment trucks and removed to a suitably licenced facility, as required.

4.3 Neutralisation Planning

Soil treatment must be pre-planned and appropriate treatment pads constructed before any excavation work is commenced on-site. Sufficient surplus materials (e.g. lime, clay, geo-synthetic liners) should be available onsite when excavations are planned in the event that unexpected PASS is disturbed. Allowances must be made to ensure sufficient space is available on site for the construction of treatment pads. Treatment pad design and the location of leachate collection sumps must be confirmed prior to the commencement of excavation works.

Groundwater seepage was observed in Bores 1, 6 and 8 to 14 at depth below existing site level at the time of the investigation of between 0.85 and 2.9 m depths. As such, adequate provision and preparation should be made prior to commencing construction to store any groundwater encountered during excavation works. It is understood water containment will be undertaken using dams lined with HDPE liners. Ponded water will need to be placed in the containment dams.

4.4 Neutralising Materials

Agricultural lime (ag lime) should be used as the preferred neutralisation material for the management of PASS as it is usually the cheapest and most readily available product. Ag lime is calcium carbonate, typically made from limestone that has been finely ground and sieved into a fine powder. It is mildly alkaline (pH between 8.5 and 9.0) with a low solubility and does not require any specialised PPE during handling or application.

The ag lime should be at least 95% purity or better (i.e. NV>95) where NV is the neutralising value, a term used to rate the neutralising value of a specific material relative to pure material. Ag lime is typically sold with an NV of 95%- 98%. Lime with an NV less than 95% is available at a reduced cost, however if lime with a lower NV is used, then liming rates must be increased by a factor of 100/NV.

Due to its low solubility, ag lime is not suitable for the neutralisation of leachate or acid impacted water which would require a fast reacting, more soluble product. The most suitable material for neutralising leachate, stockpile drainage, ponding water or groundwater seepage removed from excavations is sodium bicarbonate ($NaHCO_3$). Volumes of dosage are not known at this time. Initial broad casting of sodium bicarbonate is recommended with testing thereafter. Additional dosage to be considered upon results of testing.

4.5 Neutralisation Rate

An approximate neutralisation rate per dry tonne of excavated soil has been calculated based on *'worst case'* scenario for the soils encountered during the and required 8 kg of Ag-lime per dry tonne of disturbed soil or allowing for 'bulking up', of approximately 1.5 tonnes/m^3 'loose' in stockpile, 12 kg/m^3 to be mixed for neutralisation. This rate has been calculated based upon the observed soil lithology and the acid generating potential of the soil. Potential exists for soils at the site to contain a much greater acid generating capacity than that encountered, as well as variation in soil lithologies and depths. A safety factor of 1.5 has been included in the calculation and is considered sufficient to account for this variability.

4.6 Neutralisation Procedure

Neutralisation of PASS shall be carried out as follows, whether within the existing site boundary or at an alternative location:

- Prepare a treatment pad/ stockpile area of appropriate size to accommodate the expected volume of soil requiring treatment. The pad shall be prepared on relatively level or gently sloping ground to minimise the risk of any potential instability issues, with a fall towards a drainage sump.
- where the subgrade soils are other than low permeability clays, the surface of the pad should be lined with selected approved compacted clay (at least two layers to a combined compacted thickness of 0.5 m) or a geosynthetic liner. Where the subgrade soils comprise low permeability clay, no clay or geosynthetic lining will be required. A hydraulic conductivity of 1 x 10^{-8} mm/sec is recommended as a minimum for the material comprising the pad surface.

- A guard layer of fine ag lime shall be applied over the treatment pad to neutralise downward seepage. The guard layer shall be applied at a rate of approximately 5 kg ag lime per m^2 of surface area for every 1 m height of stockpiled soil.
- Excavated PASS material is to be spread over the prepared treatment pad in layers with an average thickness between 0.2 m and 0.3 m with a 1 m wide perimeter between the toe of the stockpiled PASS and the containment bund or drain. Care is to be taken when spreading the first layer of PASS material to ensure the guard layer remains intact.
- Allow sufficient time for the PASS material to dry prior to application of ag lime.
- Apply ag lime to the stockpiled PASS material at the overall liming rate of 8 kg Ag Lime per dry tonne or 12 kg/m^3 ('loose') of disturbed soil (Table 4) and tyne to ensure thorough mixing.
- Validation testing of treated PASS to confirm the target criteria have been met prior to spreading the next layer for treatment.
- continue the spreading/liming/harrowing/verification testing cycle until excavation is finished.
- bund off, and excavate a circumference drain to collect and localise leachate. The drain and inner bund slopes should be covered with a layer of fine lime applied to neutralise any possible leachate migrating from the stockpiled material.
- when testing indicates that lime neutralisation is complete, remove the stockpiled soil from the liming/neutralisation pad.

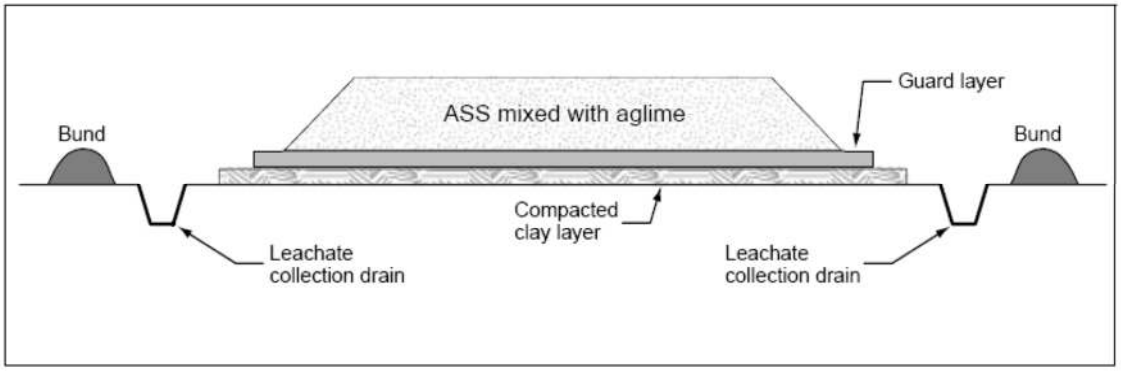

Figure 2: Schematic cross section of treatment pad

Allowances should be made during construction planning to resume sufficient land to allow for these liming pads. Leachate collection location, lining and construction should be similarly pre-planned.

4.7 Validation Testing

Category V to VH treatment levels require validation testing of the soil and drainage waters after the addition of lime to determine the effectiveness of treatment and to reduce the risk of acidic water being discharged to local water bodies. Soil and water contained within the treatment bunds shall not be removed until the target values listed in Table 3 have been achieved.

Validation samples shall be collected and tested for chromium suite testing, at a frequency of approximately one sample per batch of treated soil, or as a minimum, one sample per 250 m^3 of disturbed material. Sample collection must be performed by appropriately qualified and skilled personnel.

Additional layers of soil must not be added to the bunded stockpile for treatment until the underlying layers have been validated and analytical results meet the target criteria (Table 3). Chromium suite analysis requires a minimum of four to five working days and sufficient time should be allowed for completion of analysis.

The pH of all ponded drainage water around the confines of the treatment bunds must be measured daily. Results should be assessed against the target criteria (Table 3).

Table 3: Target Criteria for Neutralised Soil and Water

Test	Component	Target Level
Monitoring of water (refer also to Section 4.9)(i)	pH	7.0 < pH < 8.4
	Turbidity	To comply with values determined in consultation with the Authority (BLEP and EPA)
	Ammonia, Dissolved Metals, Aluminium (Al) and Iron (Fe)	Established local water quality data prior to site disturbance and ensure that these values are not exceeded
	Dissolved Oxygen	To comply with values determined in consultation with the Authority (EPA) or 80 – 110% Saturation
	Total Phosphorous	25µg/L
	Total Nitrogen	350 µg/L
	Suspended Soils	<40µg/L
	Electrical Conductivity	125-2200 µS/cm
Field screening of soil	pH_F	$5.5 < pH_F \leq 8.5$
Acid based accounting of soil (sPOCAS or chromium suite test method)	Existing + potential acidity	Zero or negative
	pH_{KCl}	$pH_{KCl} \geq 8.5$
	TAA	Zero
	TPA/S_{cr}	Zero

Note i) Daily water testing to include – pH; EC, DO and Turbidity
Weekly water testing to include – suspended solids, dissolved metals, ammonia, total nitrogen and total phosphorous

4.8 Treatment of Excavations and Swale Drains

The base of all excavations and surface of all swale drains, regardless of depth, should be thoroughly treated with lime if steel, concrete or other materials are to be installed. Ag lime is to be applied by spreading a fine layer over the base of the excavation and surface of all swale drains and lightly raking

to ensure an even distribution. An application rate of 5 kg/m^2 is recommended. Re-liming of swale drains with Ag lime, as described above, should be undertaken after every rain event.

Any groundwater that collects in excavations may require neutralisation with sodium bicarbonate to increase the pH to within the target range (Table 3) additional monitoring of aluminium and iron concentrations.

4.9 Control of Water Discharge

As discussed, there will be no water discharge from site. All on site water will be contained in HDPE lined dams where water will be pumped into containment tanks for removal to a suitably licenced facility for discharge. All excavations and soil stockpiles are to be bunded and drained accordingly such that the water drains to a containment dams.

4.10 Training and Induction

Training and induction sessions should be conducted for all contractors and staff involved in the excavation, transport or handling of soil at the site. Sessions should be designed to ensure staff are made aware of the relevant provisions within this ASSMP, their responsibilities, the classification and separation of all excavated material and most importantly, the health and safety requirements required when handling neutralising materials on site.

4.11 Management Practices

Current best practice management systems should be adopted by the contractor and complete records of all testing and treatment should be maintained. Such records should be made available to Newland Developers or their consulting engineers, as required.

4.12 Emergency Response Procedures

ASS-related construction activities may have potential to cause environmental harm, potential environmental harm, or an environmental nuisance (environmental incident). In order to mitigate the impacts of environmental harm or nuisance, all personnel require an awareness of the appropriate emergency response procedure. Some recommended emergency response procedures are summarised in Table 4.

All personnel have a duty of care to notify any incident involving environmental harm, potential environmental harm, or environmental nuisance, immediately to their supervisor. The Principal Contractors Environmental Representative and the Principal Contractors Project Manager shall be verbally advised as soon as possible following environmental incidents, and a written report should be provided within either 24 hours (major incident[1]) or 48 hours (minor incident[2]).

Table 4: Proposed Emergency Response Procedures

Construction Activity	Potential Environmental Threat	Emergency Response Procedure
Open excavation or pit	Flooding (with seepage) of open excavation or pit causing adjacent groundwater levels to fall. This can lead to generation of potential acid leachate and acid impacted water once the excavation is drained.	• Inform site foreman and project manager/ environmental officer. • Determine the pH of water within excavation. • If required, treat water to correct pH within excavation. • Drain excavation/ pit to tanks/ ponds for water quality assessment prior to discharge.
Stockpiling and Neutralisation of PASS material	Stockpile washes or slips outside of bunded treatment pad. Breach in stockpile containment bund.	• Inform site foreman and project manager/ environmental officer. • Estimate volume of uncontained material. • Close breach(es) in bund(s). • Assess and correct pH in adjacent watercourse (if any). • Recover soil and place within a bunded area/ treatment pad. • Over-excavate contaminated area to 0.2 m depth. • Apply and mix ag lime at rate of 12 kg/dry tonne in area of breach.

5. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for the proposed Bioenergy Facility at 45 Wallum Place, Byron Bay. The work was carried out under Douglas Partners Pty Ltd '*Conditions of Engagement*'. This report is provided for the exclusive use of Skala Australasia Pty Ltd for the specific project and purpose as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

[1] A 'major incident' is an incident that will have direct impact on the safe operation of the site or health of local water bodies. This would also include any uncontrolled releases into the canal, e.g. discharge of hazardous materials into a stormwater drain.

[2] A 'minor incident' is an incident that does not have a direct impact on the safe operation of the site or on the health of local water bodies, e.g. diesel or hydraulic fluid spills which are easily contained within the site compound, damage to vegetation, or injuries to wildlife.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

6. References

Acid Sulfate Soil Management Advisory Committee, "Acid Sulfate Soil Manual," New South Wales, August 1998.

Australian and New Zealand Environment Conservation Council (ANZECC), "Water Quality Guidelines", Version –October 2000.

Douglas Partners Pty Ltd

Appendix A

About This Report
Soil Descriptions
Symbols and Abbreviations

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with 'Mix of Soil and Cobbles/Boulders' with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

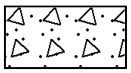
Symbols & Abbreviations

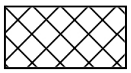
Graphic Symbols for Soil and Rock

General

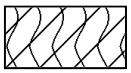

Asphalt

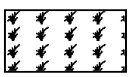

Road base

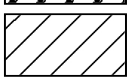

Concrete


Filling

Soils


Topsoil

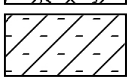

Peat


Clay


Silty clay

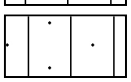

Sandy clay

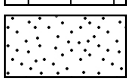

Gravelly clay

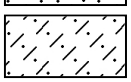

Shaly clay

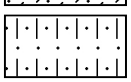

Silt


Clayey silt


Sandy silt

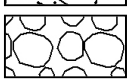

Sand


Clayey sand


Silty sand


Gravel

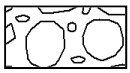

Sandy gravel


Cobbles, boulders

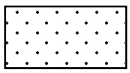

Talus

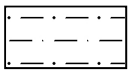
Sedimentary Rocks

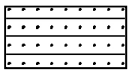

Boulder conglomerate

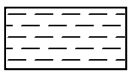

Conglomerate


Conglomeratic sandstone

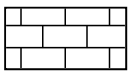

Sandstone


Siltstone

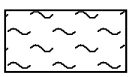

Laminite

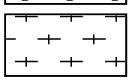

Mudstone, claystone, shale

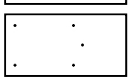

Coal


Limestone

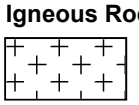
Metamorphic Rocks

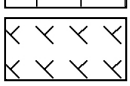

Slate, phyllite, schist

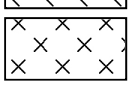

Gneiss

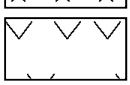

Quartzite

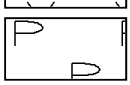
Igneous Rocks


Granite


Dolerite, basalt, andesite

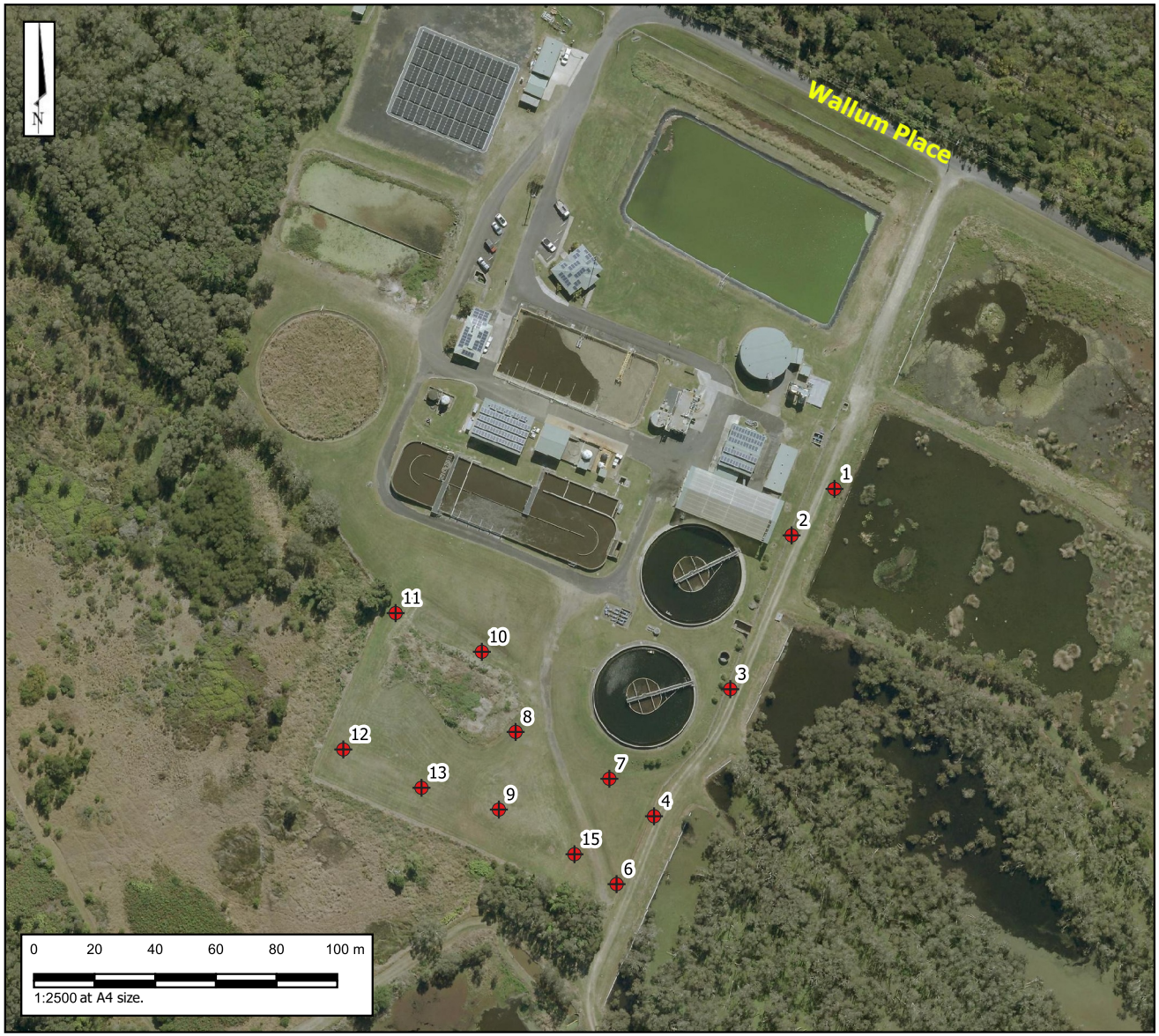

Dacite, epidote

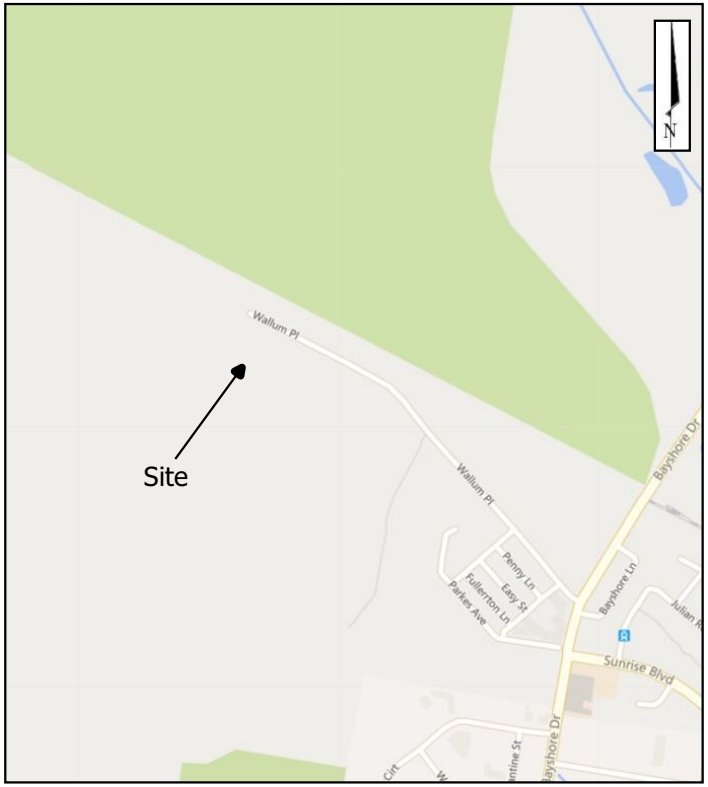

Tuff, breccia


Porphyry

Appendix B

Drawing 1 – Site and Test Location Plan





Site Locality

Legend:

Approximate borehole location and number

Image adapted from Metromap dated 24 August 2020.
Site locatlity not to scale.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Skala Australasia Pty Ltd OFFICE: Gold Coast DATE: March 2021	**Site and Test Location Plan** **Proposed Bioenergy Facility** **45 Wallum Place, Byron Bay**	PROJECT No: 200486.00 DRAWING No: 1 REVISION: 0

Appendix C

Borehole Logs (Bores 1 to 4 and 6 to 15)

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.7057 AHD
EASTING: 556369.269
NORTHING: 6833172.4898
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
5	0.0	FILL Clayey SAND with gravel (SC/SW): fine to coarse grained, brown, low to medium plasticity clay, with fine to medium subangular gravel, moist, appeared poorly compacted		E	0.0				
	0.1				0.1				
	0.2				0.2				
	0.4			B	0.4				
	0.5			E	0.5				
	0.7				0.7				
1	0.9			E	0.9				
	1.0				1.0				
	1.2	Sandy SILT (ML): low plasticity, black, fine to medium sand, moist, estimated stiff, alluvial		E	1.2				
	1.3				1.3				
4	1.9	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, moist, estimated medium dense, alluvial		E	1.9				
2	2.0				2.0				2
	2.2	SAND (SP): fine to medium grained, pale grey, trace low plasticity silt, moist, estimated medium dense, alluvial							
	2.4	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, estimated medium dense, alluvial						▼	
3	3.0	Bore discontinued at 3.0m depth - Limit of investigation							3
2									4
1									5
0									6
-1									7
-2									

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.5m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.852 AHD
EASTING: 556355.06
NORTHING: 6833157.32
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, brown, fine to coarse sand, with fine to medium subangular gravel,, moist, appeared poorly to well compacted		E	0.0 - 0.1				
				E	0.4 - 0.5				
	0.9	FILL Sandy CLAY (CI): medium plasticity, black, brown and grey, fine to medium sand, trace fine to medium subangular gravel, moist, hard		E	0.9 - 1.0				
	1.1	FILL Sandy GRAVEL (GW): fine to coarse grained, blue-grey, fine to medium subangular sand, with low plasticity silt, moist, appeared well compacted							
	1.2	Bore discontinued at 1.2m depth - Refusal on obstruction. Limit of Investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.889 AHD
EASTING: 556334.61
NORTHING: 6833106.94
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red, fine to coarse sand, with fine to medium subangular gravel, moist, appeared poorly to moderately compacted		E	0.0 0.1 0.2				
				B	0.4				
				E	0.5 0.6				
	0.8	FILL CLAY (CI-CH): medium to high plasticity, red, trace fine sand, moist, appeared moderately compacted		E	0.8 0.9				
		- trace fine to medium subangular gravel		E	1.3 1.4				
	1.45	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, moist, estimated medium dense, alluvial							
	1.5	Bore discontinued at 1.5m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.170 AHD
EASTING: 556309.27
NORTHING: 6833065.38
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
		FILL Sandy CLAY (CI-CH): medium to high plasticity, red-brown, fine to medium sand, with fine to medium subangular gravel, moist, appeared poorly compacted		E	0.0				
					0.1				
				D	0.2				
				E	0.4				
					0.5				
					0.8				
	0.9			E	0.9				
		Sandy SILT (ML): low plasticity, black, fine to medium sand, moist, very stiff, alluvial		E	1.0				
					1.2				
				D	1.4				
	1.5			E	1.5				
		Bore discontinued at 1.5m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 4.832 AHD
EASTING: 556296.82
NORTHING: 6833043.17
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
		FILL Sandy CLAY (CI): medium plasticity, red and brown, fine to medium sand, trace fine to medium subangular gravel, moist, appeared well compacted		E	0.0 0.1				
				D	0.3 0.4				
	0.5	FILL Sandy SILT (ML: low plasticity, black, fine to medium sand, moist, stiff		E E D	0.5 0.6			▼	
	1.2	SAND (SP): fine to medium, poorly grained, pale grey, trace low plasticity silt, wet, medium dense		E	1.2 1.3				
					1.5				
	1.7	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, medium dense, alluvial		S			3,4,9 N = 13		
					1.95				
					3.0				
				S			4,12,15 N = 27		
					3.45				
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.85m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.639 AHD
EASTING: 556294.61
NORTHING: 6833077.75
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
		FILL Sandy CLAY (CI): medium plasticity, red-brown, fine to coarse sand, trace fine to medium subangular gravel, moist, appeared poorly to well compacted		E	0.0				
					0.1				
					0.2				
				B	0.4				
				E	0.5				
					0.7				
					0.9				
				E	1.0				
				E	1.3				
	1.4	Bore discontinued at 1.4m depth - Refusal on obstruction. Limit of Investigation			1.4				

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.657 AHD
EASTING: 556263.79
NORTHING: 6833093.27
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red-brown, fine to medium sand, with fine to medium subangular gravel, appeared poorly to well compacted		E	0.0–0.1				
				E	0.4–0.5				
				E	0.9–1.0				
	1.2	FILL Sandy CLAY (CI-CH): medium to high plasticity, red-brown, fine to coarse sand, trace fine to medium subangular gravel, moist, very stiff		E	1.2–1.3				
					1.5			▽	
	1.6	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, medium dense, alluvial		S	1.95		4,4,4 N = 8	▼	
				S	3.0–3.45		10,13,16 N = 29		
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater measured in well at 1.4m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 6.505 AHD
EASTING: 556258.14
NORTHING: 6833067.83
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
									5 10 15 20
		FILL/ CLAY (CI): medium plasticity, red-brow with fine to medium sand, trace fine to medium subangular gravel, moist, appeared poorly to well compacted		E	0.0				
					0.1				
				E	0.4				
					0.5				
				E	0.9				
					1.0				
	1.3			E	1.3				
		FILL Sandy CLAY (CI-CH): medium to high plasticity, red and orange-grey, fine to medium sand, trace fine subangular gravel, moist, appeared well compacted			1.4				
					1.5				
				S			2,8,10 N = 18		
				E	1.9				
					1.95				
					2.0				
	2.4			E	2.4				
		Silty SAND (SM): fine to medium grained, well graded, black, low plasticity silt, moist, medium dense, alluvial			2.5				
				D	2.7			▼	
					3.0				
	3.2			S			5,4,5 N = 9		
		Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, moist, medium dense, alluvial			3.45				
					4.5				
				S			8,12,16 N = 28		
					4.95				
					6.0				
				S			3, 20, 30/100mm		
	6.4				6.4				
		Bore discontinued at 6.4m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.9m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 6.396 AHD
EASTING: 556252.79
NORTHING: 6833119.61
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0			E	0.0 – 0.1				
	0.3	FILL Silty SAND (SM): fine to medium grained, well graded, brown, low plasticity silt, trace fine subangular gravel, moist, medium dense		E	0.3 – 0.4				
		FILL Gravelly SAND (SW/SM): fine to medium grained, pale brown, fine to medium subangular gravel, with low plasticity silt, moist, appeared well compacted		E	0.9 – 1.0				
	1.4	FILL Sandy CLAY (CI): medium plasticity, dark grey, fine to coarse sand, trace fine to medium subangular gravel, moist, appeared well compacted		E	1.4 – 1.5				
				S			1,1,1 N = 2		
	1.9	Sandy SILT (ML): low plasticity, black, fine to medium sand, estimated firm, alluvial		E	1.9 – 2.0			▼	
	2.4	Silty SAND (SM): fine to medium grained, dark grey and brown, low plasticity silt, wet, medium dense, alluvial		E	2.4 – 2.5				
				S	3.0		3,8,15 N = 23		
	3.4	SAND (SP): fine to medium grained, pale grey, trace low plasticity silt, wet, medium dense, alluvial			3.45				
	4.0	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, medium dense, alluvial		S	4.5 – 4.95		5,10,15 N = 25		
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.1m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.029 AHD
EASTING: 556224.42
NORTHING: 6833132.44
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
		FILL Silty SAND (SM): fine to coarse grained, dark brown, low plasticity silt, trace fine subangular gravel, moist, appeared poorly compacted		E	0.0 0.1				
		- trace cobbles		E	0.4 0.5				
				E	0.9 1.0			▽	
	1.4	Silty SAND (SM): fine to medium grained, well graded, dark brown to black, low plasticity silt, wet, medium dense		E	1.4 1.5				
				S			1,5,11 N = 16		
				E	1.9 1.95 2.0				
				S	3.0		3,8,12 N = 20		
					3.45				
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased
TYPE OF BORING: Auger
WATER OBSERVATIONS: Groundwater measured at 1.10m in monitoring well
REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 4.531 AHD
EASTING: 556206.97
NORTHING: 6833087.79
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
		FILL Sandy CLAY (CI): medium plasticity, red, fine to medium sand, trace fine to medium subangular gravel, moist, appeared poorly to moderately compacted		E	0.0 – 0.1				
	0.4	Silty SAND (SM): fine to coarse grained, dark brown, low plasticity silt, moist, loose		E	0.4 – 0.5				
				D	0.8 – 0.9				
	0.9	SAND (SP): fine to coarse grained, pale grey, wet, medium dense, alluvial		E	1.0			▼	
	1.4	Silty SAND (SM): fine to medium grained, dark brown to black, low plasticity silt, moist, medium dense, alluvial		S	1.5 – 1.95		5,10,15 N = 25		
		- very dense		S	3.0 – 3.25		17, 30/100mm		
		- trace fine to medium subrounded gravel							
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.95m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.057 AHD
EASTING: 556232.68
NORTHING: 6833075.09
DIP/AZIMUTH: 90°/--

BORE No: 13
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Silty SAND (SM): fine to medium, well graded, dark brown, low plasticity silt, moist, appeared poorly compacted		E	0.0				
				E	0.1				
					0.4				
				E	0.5				
					0.9				
	1.0			E	1.0			▽	
	1.2	FILL Sandy CLAY with gravel (CI): medium plasticity, dark grey, fine to coarse sand, fine to coarse subangular gravel, wet, appeared well compacted		E	1.2				
					1.3				
	1.5	SAND (SP): fine to coarse grained, pale grey, wet, medium dense, alluvial		S	1.45		5,9,11 N = 20		
				E	1.5				
					1.6				
	2.2	Silty SAND (SM): fine to medium grained, dark brown-grey, low plasticity silt, wet, medium dense, allivial							
					3.0				
				S			6,13,17 N = 30		
	3.45	Bore discontinued at 3.45m depth - Limit of investigation			3.45				

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater measured at 1.25m in monitoring well

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.003 AHD
EASTING: 556282.99
NORTHING: 6833053.05
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red-brown, fine to medium sand, trace fine to medium subangular gravel, moist, appeared poorly compacted		E	0.0 - 0.2				
	0.4	FILL Sandy SILT (ML): low plasticity, black, fine to medium sand, moist, appeared poorly to moderately compacted		B, E	0.4 - 0.6				
	1.0			E	0.9 - 1.0				
	1.2	SAND (SP): fine to medium grained, pale grey, trace low plasticity silt, wet, estimated medium dense, alluvial		E	1.2 - 1.3			▼	
	1.5	Bore discontinued at 1.5m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased
TYPE OF BORING: Auger
WATER OBSERVATIONS: Groundwater observed at 1.3m depth
REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix D

Table 2 – Summary of ASS Test Results
Laboratory Test Results

Table 4: Summary of ASS Screening and Chromium Suite Test Results

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
Bore 1										
0.25	Fill	5.5	2.9	2.6	3	-	-	-	-	-
0.75	Fill	5.7	2.8	2.9	3	-	-	-	-	-
1.25	Sandy Silt	6.0	1.9	4.1	3	-	-	-	-	-
1.75	Sandy Silt	5.9	2.5	3.3	3	-	-	-	-	-
Bore 6										
0.50	Fill	5.4	3.5	1.9	1	4.4	0.013	0.08	0.05	0.14
1.0	Fill	4.9	2.5	2.1	3	4.0	0.021	0.16	<0.02	0.18
1.5	Sand	5.6	2.3	3.3	3	5.4	0.019	<0.02		<0.02
2.0	Silty Sand	5.6	2.3	3.3	3	5.4	0.019	<0.02	-	0.03
Bore 11										
0.50	Fill	5.5	2.6	2.9	3	5.1	0.017	0.03	-	0.04
1.0	Fill	4.7	2.2	2.5	3	4.5	0.013	0.08	-	0.10
1.50	Silty Sand	6.7	2.9	3.8	3	7.5	0.052	<0.02	-	<0.02
2.00	Silty Sand	6.6	3.0	3.6	3	6.4	0.049	<0.02	-	0.05
Bore 12										
0.25	Fill	4.7	3.1	1.6	3	-	-	-	-	-
0.75	Silty Sand	4.7	2.2	2.5	3	-	-	-	-	-
1.25	Sand	4.9	3.1	1.8	1	-	-	-	-	-
1.75	Silty Sand	6.0	2.4	3.6	3	-	-	-	-	-

Notes: (i) – 1 - denotes slight effervescence;
2 - denotes moderate reaction;
3 – denotes vigorous reaction;
4 – denotes very strong effervescence accompanied by escape of gas/heat;
F – indicates a bubbly/frothy reaction (organics).

(ii) Highlighted cell denotes level of existing plus potential acidity above threshold level of 0.03%S.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2103696**	Page	: 1 of 6
Client	: **DOUGLAS PARTNERS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GARY SAMUELS	Contact	: John Pickering
Address	: 439 MONTAGUE ROAD WEST END QLD, AUSTRALIA 4101	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 5568 8900	Telephone	: +61 7 3552 8634
Project	: 200486.00	Date Samples Received	: 10-Feb-2021 23:50
Order number	: ----	Date Analysis Commenced	: 18-Feb-2021
C-O-C number	: ----	Issue Date	: 18-Feb-2021 17:35
Sampler	: JESSE WOTTON		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 32		
No. of samples analysed	: 16		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
~ = Indicates an estimated value.

- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	1/0.25	1/0.75	1/1.25	1/1.75	6/0.5
			Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00
Compound	CAS Number	LOR	Unit	EB2103696-001	EB2103696-003	EB2103696-005	EB2103696-007	EB2103696-010
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**5.5**	**5.7**	**6.0**	**5.9**	**5.4**
pH (Fox)	----	0.1	pH Unit	**2.9**	**2.8**	**1.9**	**2.5**	**3.5**
Reaction Rate	----	1	-	**3**	**3**	**3**	**3**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	6/1.0	6/1.5	6/2.0	11/0.5	11/1.0
			Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00
Compound	CAS Number	LOR	Unit	EB2103696-012	EB2103696-014	EB2103696-016	EB2103696-018	EB2103696-020
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**4.9**	**5.6**	**5.6**	**5.5**	**4.7**
pH (Fox)	----	0.1	pH Unit	**2.5**	**2.3**	**2.3**	**2.6**	**2.2**
Reaction Rate	----	1	-	**3**	**3**	**3**	**3**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	11/1.5	11/2.0	12/0.25	12/0.75	12/1.25
			Sampling date / time	08-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00
Compound	CAS Number	LOR	Unit	EB2103696-022	EB2103696-024	EB2103696-025	EB2103696-027	EB2103696-029
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**6.7**	**6.6**	**4.7**	**4.7**	**4.9**
pH (Fox)	----	0.1	pH Unit	**2.9**	**3.0**	**3.1**	**2.2**	**3.1**
Reaction Rate	----	1	-	**3**	**3**	**3**	**3**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	12/1.75	----	----	----	----
			Sampling date / time	08-Feb-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2103696-031	--------	--------	--------	--------
				Result	----	----	----	----
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**6.0**	----	----	----	----
pH (Fox)	----	0.1	pH Unit	**2.4**	----	----	----	----
Reaction Rate	----	1	-	**3**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2105562**	Page	: 1 of 4
Client	: **DOUGLAS PARTNERS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GARY SAMUELS	Contact	: John Pickering
Address	: 439 MONTAGUE ROAD WEST END QLD, AUSTRALIA 4101	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 5568 8900	Telephone	: +61 7 3552 8634
Project	: 200486.00	Date Samples Received	: 25-Feb-2021 11:14
Order number	: ----	Date Analysis Commenced	: 08-Mar-2021
C-O-C number	: ----	Issue Date	: 08-Mar-2021 12:56
Sampler	: JESSE WOTTON		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 8		
No. of samples analysed	: 8		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Sample ID	6/1.0 EB2103696_012	6/1.5 EB2103696_014	6/2.0 EB2103696_016	6/0.5 EB2103696_010	11/1.0 EB2103696_020
				Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00
					EB2105562-001	EB2105562-002	EB2105562-003	EB2105562-004	EB2105562-005
					Result	Result	Result	Result	Result
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**4.0**	**5.0**	**5.4**	**4.4**	**4.5**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**98**	**3**	**5**	**53**	**53**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.16**	<0.02	<0.02	**0.08**	**0.08**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		**0.021**	**0.014**	**0.019**	**0.013**	**0.013**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**13**	<10	**12**	<10	<10
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.02	**----**	**----**	<0.02	**----**
HCl Extractable Sulfur (20Be)	----	0.02	% S		<0.02	**----**	**----**	**0.02**	**----**
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	**----**	**----**	**0.05**	**----**
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	**----**	**----**	**23**	**----**
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	**----**	**----**	**0.04**	**----**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**0.18**	<0.02	**0.03**	**0.14**	**0.10**
Net Acidity (acidity units)	----	10	mole H+ / t		**112**	**12**	**17**	**84**	**61**
Liming Rate	----	1	kg CaCO3/t		**8**	<1	**1**	**6**	**4**
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		**0.18**	<0.02	**0.03**	**0.14**	**0.10**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		**112**	**12**	**17**	**84**	**61**
Liming Rate excluding ANC	----	1	kg CaCO3/t		**8**	<1	**1**	**6**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	11/1.5 EB2103696_022	11/2.0 EB2103696_024	11/0.5 EB2103696_018	----	----
			Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	EB2105562-006	EB2105562-007	EB2105562-008	--------	--------
				Result	Result	Result	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**7.5**	**6.4**	**5.1**	**----**	**----**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	**17**	**----**	**----**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	**0.03**	**----**	**----**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	**0.052**	**0.049**	**0.017**	**----**	**----**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**33**	**31**	**10**	**----**	**----**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**1.04**	**----**	**----**	**----**	**----**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**208**	**----**	**----**	**----**	**----**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**0.33**	**----**	**----**	**----**	**----**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**----**	**----**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**0.05**	**0.04**	**----**	**----**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**31**	**27**	**----**	**----**
Liming Rate	----	1	kg CaCO3/t	<1	**2**	**2**	**----**	**----**
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.05**	**0.05**	**0.04**	**----**	**----**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**33**	**31**	**27**	**----**	**----**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**2**	**2**	**2**	**----**	**----**

Appendix H – Public Submissions Analysis Matrix

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Project: Analysis of Public Submissions - Byron Bioenergy Facility

Client: Byron Shire Council

Sub. No.	Type	Name	Objection?	Reason for objection / issue?						
				Impact of the flare on fauna	EIS should have been on all wetlands, not 0.8ha	Access road too close to the wetlands will cause disturbance to fauna	Traffic will impact birds and other flora/fauna lifecycles	Proposed BEF location at STP wetlands not a good choice because of existing wetland values	No assessment of indirect impacts to biodiversity within the larger STP wetlands	BEF will cause GHG emissions
1	Organisation	BirdLife Northern Rivers	Y			1	1	1	1	
2	Individual		Y				1	1	1	
3	Individual		Y			1	1	1	1	
4	Individual	Bird life Australia Shorebird Monitoring Program Coordinator	Y			1		1	1	
5	Individual		Y			1	1	1	1	
6	Individual		Y						1	1
7	Individual		Y			1		1	1	
8	Individual		Y					1	1	
9	Individual		Y					1	1	
10	Individual		Y				1	1	1	
11	Individual		Y				1			
12	Individual		Y					1		
13	Individual		Y					1	1	
14	Individual		Y				1	1	1	
15	Individual		Y					1	1	
16	Individual		Y			1	1	1	1	
17	Individual		Y				1	1	1	
18	Individual		Y				1		1	
19	Individual		Y					1		
20	Individual		Y				1			
21	Individual		Y				1	1		
22	Individual		Y			1	1	1	1	
23	Individual		Y				1		1	
24	Organisation	Byron Bird Buddies	Y					1		
25	Individual		Y				1	1	1	
26	Individual		Y				1	1		
27	Individual		Y					1		
28	Individual		Y					1		
29	Individual		Y				1	1		
30	Individual		Y						1	
31	Individual		Y				1		1	
32	Individual		Y			1	1		1	
33	Individual		Y			1	1		1	
34	Individual		Y				1	1	1	
35	Organisation	Federation University, Centre for eResearch and Digital Innovation	Y						1	
36	Individual		Y						1	
37	Individual		Y					1	1	
38	Individual		Y					1	1	
39	Individual		Y						1	1
40	Individual		Y							

		Reason for objection / issue?												
Sub. No.	**Type**	**Air quality impacts due to haulage and BEF plant emissions**	**Noise impacts to wildlife during construction and/or operation**	**Disturbance to biodiversity (including threatened species) by construction and operation**	**Lack of direct consultation with local community organisations (e.g. bird watching groups)**	**Impacts to bird watching recreation activities and tourism**	**Explosive gas storage on site is a safety concern to people and wildlife**	**Impact to wildlife corridors**	**Noise impacts to the community**	**Traffic impacts to the community**	**Height exceedence of BEF not supported**	**Referral to Commonwealth / Federal legislation required**	**No business plan, not a worthwhile investment, no cost-benefit analysis undertaken**	**Future growth is not accounted for in the development (wetland encroachment)**
1	Organisation			1	1									
2	Individual			1										
3	Individual			1	1	1								
4	Individual			1		1								
5	Individual	1									**1**	**1**	**1**	**1**
6	Individual			1										
7	Individual			1										
8	Individual			1	1	1								
9	Individual			1			1							
10	Individual		1	1	1	1								
11	Individual		1	1										
12	Individual			1		1								
13	Individual			1				1						
14	Individual			1										
15	Individual													
16	Individual		1	1	1	1						**1**		
17	Individual		1		1		1							
18	Individual		1	1	1	1			1	1			**1**	
19	Individual			1										
20	Individual		1	1										
21	Individual			1										
22	Individual			1	1									
23	Individual			1	1	1								
24	Organisation			1										
25	Individual		1									**1**		
26	Individual		1	1	1									
27	Individual			1		1								
28	Individual			1										
29	Individual			1		1								
30	Individual			1										
31	Individual		1	1		1								
32	Individual		1	1		1								
33	Individual		1	1	1	1								
34	Individual			1										
35	Organisation			1								**1**		
36	Individual		1	1										
37	Individual			1						1				
38	Individual		1	1					1	1	**1**		**1**	
39	Individual			1									**1**	
40	Individual						1							

Project: Analysis of Public Submissions - Byron Bioenergy Facility
Client: Byron Shire Council

Sub. No.	Type	Name	Objection?	Reason for objection / issue?						
				Impact of the flare on fauna	EIS should have been on all wetlands, not 0.8ha	Access road too close to the wetlands will cause disturbance to fauna	Traffic will impact birds and other flora/fauna lifecycles	Proposed BEF location at STP wetlands not a good choice because of existing wetland values	No assessment of indirect impacts to biodiversity within the larger STP wetlands	BEF will cause GHG emissions
38	Individual		Y					1	1	
39	Individual		Y						1	1
40	Individual		Y							
41	Individual		Y				1	1	1	
42	Individual		Y					1	1	
43	Individual		Y					1	1	
44	Individual		Y			1	1		1	
45	Organisation	Strata Committee of Bayshore Apartments	Y							
46	Individual		Y							1
47	Individual		Y				1	1	1	1
48	Organisation	Byron Environment Centre	Y						1	1
49	Individual		Y			1	1	1		
50	Individual		Y			1	1	1	1	
51	Individual		Y							
52	Individual		Y			1		1	1	
53	Individual		Y				1		1	
54	Individual		Y					1		
55	Individual		Y				1		1	
56	Individual		Y				1	1	1	
57	Individual		N							
58	Individual		Y			1	1	1	1	
59	Individual		Y					1	1	
60	Individual		Y					1	1	
61	Individual		Y							
62	Individual		Y				1	1	1	
63	Individual		Y			1	1	1	1	
64	Individual		Y					1	1	
65	Organisation	Community Alliance for Byron Shire - **Late Submission**	Y							
66	Organisation	Northern Regional Planning Panel Record of Briefing 22 Sept	NA	1		1	1	1		
67	Organisation	Byron Bird Buddies Project Manager - **Late Submission**	Y		1	1	1			
68	Organisation	Byron Environment Centre Committee Member **- Late Submission**	Y	1	1	1				1
69	Individual	**Late Submission**	Y							
70	Individual	**Late Submission**	Y							
71	Organisation	Strata Committee of Bayshore Apartments								
	Totals			**2**	**2**	**18**	**34**	**43**	**46**	**6**

		Reason for objection / issue?												
Sub. No.	**Type**	**Air quality impacts due to haulage and BEF plant emissions**	**Noise impacts to wildlife during construction and/or operation**	**Disturbance to biodiversity (including threatened species) by construction and operation**	**Lack of direct consultation with local community organisations (e.g. bird watching groups)**	**Impacts to bird watching recreation activities and tourism**	**Explosive gas storage on site is a safety concern to people and wildlife**	**Impact to wildlife corridors**	**Noise impacts to the community**	**Traffic impacts to the community**	**Height exceedence of BEF not supported**	**Referral to Commonwealth / Federal legislation required**	**No business plan, not a worthwhile investment, no cost-benefit analysis undertaken**	**Future growth is not accounted for in the development (wetland encroachment)**
38	Individual		1	1					1	1	**1**		**1**	
39	Individual			1									**1**	
40	Individual						1							
41	Individual		1	1									**1**	
42	Individual			1										
43	Individual			1										
44	Individual		1		1									
45	Organisation								1	1			**1**	
46	Individual	1							1	1			**1**	
47	Individual			1										
48	Organisation			1									**1**	
49	Individual			1	1	1								
50	Individual			1	1									
51	Individual			1						1				
52	Individual			1	1									
53	Individual		1			1			1	1				
54	Individual			1										
55	Individual		1			1			1	1				
56	Individual			1		1								
57	Individual													
58	Individual				1									
59	Individual			1		1								
60	Individual			1		1								
61	Individual	1							1	1				
62	Individual		1	1		1			1	1				
63	Individual		1	1		1								
64	Individual			1										
65	Organisation				1									
66	Organisation	1							1	1				
67	Organisation				1				1			1		
68	Organisation									1		1	1	
69	Individual									1			1	
70	Individual	1								1				
71	Organisation													
	Totals	**5**	**19**	**51**	**18**	**21**	**3**	**1**	**10**	**14**	**2**	**6**	**10**	**1**