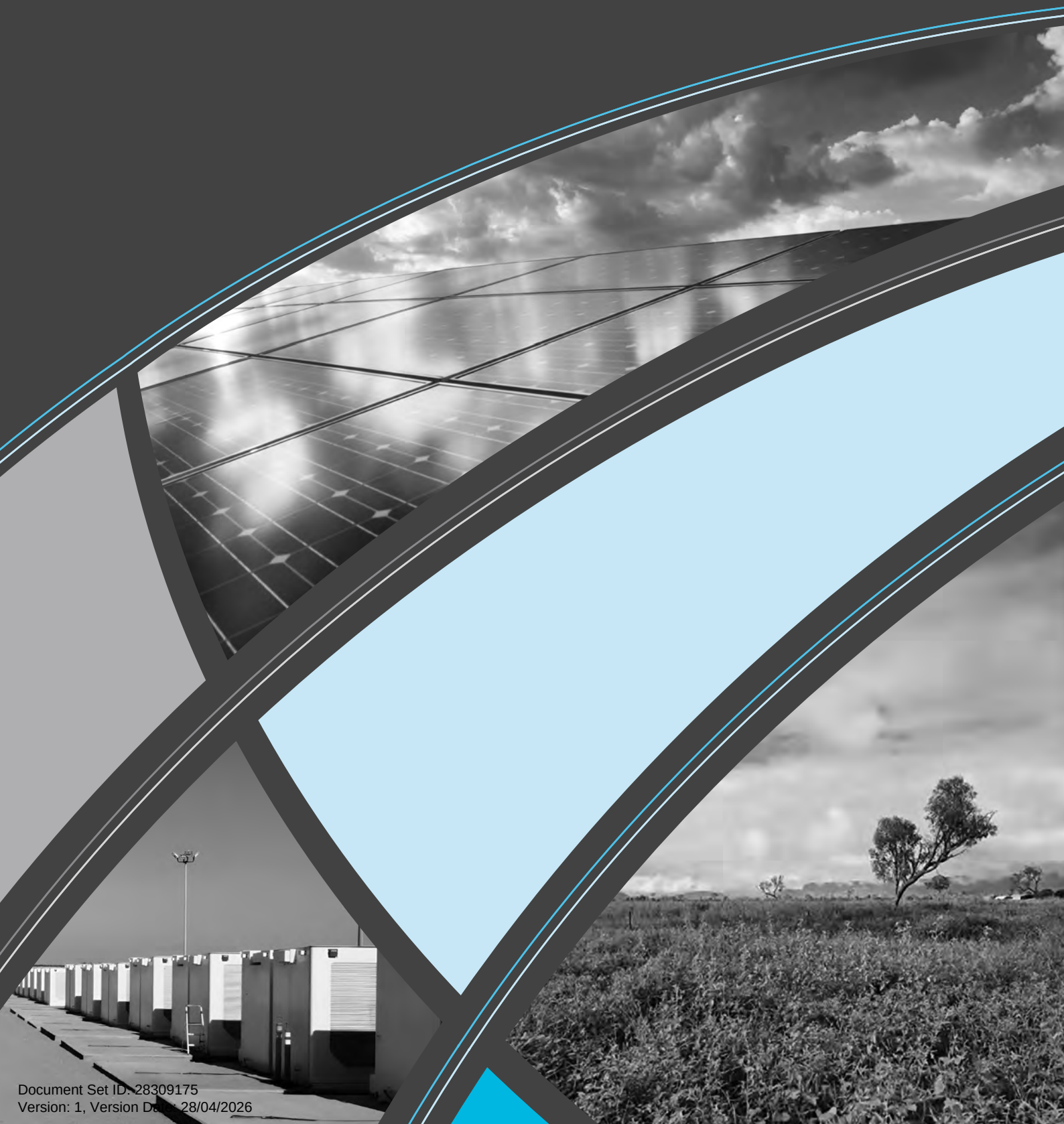
Appendix

Bushfire assessment



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20 April 2026

Assessment Manager

Re: Development application - Integrated impact assessment context

1.1 Purpose

The intent of this letter is to outline the planning context and explain the assessment approach adopted for the technical impact assessments which were prepared to support the development application. With consideration of changes to the planning framework introduced on 12 December 2025, which have directly influenced the assessment pathway for the project.

1.2 Context

Supernode North BESS ProjectCo Pty Ltd as trustee for Supernode North BESS Project Trust is a wholly owned portfolio company of funds managed by Quinbrook Infrastructure Partners (Quinbrook). Private Energy Partners Pty Ltd (PEP) is an affiliated Quinbrook entity and is a dedicated development, delivery, and operations service provider. Together they propose to develop a Battery Energy Storage System (BESS), substation and transmission lines to facilitate electricity supply for future manufacturing facilities as part of the broader Northern Quartz Campus (NQC) Project (prescribed project).

The project was originally properly made on 12 September 2025 with Townsville City Council (TCC), as the Assessment Manager, as a combined Battery Energy Storage System (BESS), substation, and transmission line project. Following the commencement of the *Planning (Battery Storage Facilities) and Other Legislation Amendment Regulation 2025* on 12 December 2025, the original application was taken to be invalid, and a revised assessment pathway was established resulting in the separate assessment of the BESS.

As a result of the changes to assessment pathway and following detailed pre-lodgement discussions with SARA, TCC, and the Office of the Coordinator-General (OCG), it was agreed that the development components should be assessed separately based on the land-use as defined by the *Planning Regulation 2017.* As such, the development components have been separated into two development application packages. The delineation of development infrastructure within each of the application packages is as follows:

- Development application 1:
    - Development permit for Material Change of Use of a premises for a battery storage facility.

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- Development application 2:
  - Development permit for Material Change of Use for Major Electricity Infrastructure (transmission lines), and
  - Development permit for Material Change of Use for a Substation

While administratively assessed separately, these components function collectively to deliver an energised, operational BESS which is connected to the substation via overhead transmission lines. This electrical infrastructure will connect into the publicly owned Calcium Substation which is to be delivered separately by Powerlink Queensland.

1.3 Environmental impact assessment approach

The project has been designed, engineered and assessed as an integrated system. The environmental and technical assessments have been developed on a whole-of-project basis, consistent with the operational and construction realities of delivering the project.

Accordingly, all technical impact assessments have assessed the combined impacts of the integrated complete development (this including the substation, transmission line and BESS facility as a single unified development). The information provided within the technical impact assessments are provided in their completeness and include outcomes from the original application RFI period previously undertaken in an effort to provide transparency of information.

This integrated methodology also provides a more accurate representation of real-world impacts, enables more effective identification and mitigation of cumulative impacts, and supports a streamlined, practical delivery pathway for all project components.

1.4 Assessment outcomes

The technical impact assessments that have been completed to support the development applications packages have demonstrate compliance with both the requirements with *State Code 27: Battery storage facility* and the *TCC Planning scheme* codes. A summary of the model considerations and outcomes from the technical impact assessments are provided in Table 1.

Table 1 Summary of technical impact assessment outcomes

Impact assessment	Impact assessment considerations	Compliance
Noise Impact assessment	Acoustic objectives of the Environmental Protection (Noise) Policy 2019.	• State Code 27: PO20 & PO21 • TCC Planning Scheme Codes: – High Impact Industry
Bushfire	• National Construction Code 2022 (NCC) • State Planning Policy (SPP) and associated guidelines (Department of Infrastructure, Local Government and Planning (DILGP), July 2017) • Townsville City Plan 2014 (version 2024/01) • Australian Standard AS3959:2018 – Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018)	• State Code 27: – PO2 - PO7 – PO13 – PO15 • TCC Planning Scheme Codes: – Bushfire Hazard Overly Code

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Impact assessment	Impact assessment considerations	Compliance
Traffic	• Queensland Government's *Guide to Traffic Impact Assessment* (DTMR 2018) • Townsville City Plan Part 9.3.5: Transport impact, access and parking code (Townsville City Council 2020) • QLD *Transport Infrastructure Act 1994* (TI Act)	• State Code 27: PO24 – PO28 • TCC Planning Scheme Codes: – High Impact Industry – Transport Impact, Access, and Parking Code – Works Code
Visual	• *Guidelines for Landscape and Visual Impact Assessment Third Edition* (2013) (the GLVIA), Landscape Institute and Institute of Environmental Management and Assessment • Guidance Note for Landscape and Visual Assessment (2018), Australian Institute of Landscape Architects (Queensland).	• State Code 27: PO22 • TCC Planning Scheme Codes: – High Impact Industry – Telecommunications, Facilities and Utilities Code – Landscape Code
Water resource	• Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia. Version 4.2, August 2024. • DES 2016, Manual for assessing consequence categories and hydraulic performance of structures ESR/2016/1933 Version 5.02, Department of Environment and Science.	• State Code 27: PO16-PO19 • TCC Planning Scheme Codes: – High Impact Industry – Natural Assets Overlay Code – Healthy Water Code – Landscape Code – Flood Hazard Overlay Code
Hazard assessment report	• Work Health and Safety Regulation 2011 – Schedule 15 • AS/NZ ISO 31000:2018 Risk Management - Guidelines	• State Code 27: PO5-PO7 • TCC Planning Scheme Codes: – High Impact Industry – Works Code – Bushfire Hazard Overlay Code
Fire Safety Study	• Large-scale battery energy storage system installations v1.0, 05/02/2025 • *Queensland Fire and Emergency Services Act, 1990* • AS/NZ ISO 31000:2018 Risk Management - Guidelines • FM Global Property loss prevention data sheet 5-33 electrical energy storage systems	• State Code 27: PO5-PO7 • TCC Planning Scheme Codes: – High Impact Industry – Works Code

1.5 Closing

The aim of this letter is to assist the Assessment Manager in understanding the relationship between the project components, the legislative changes that have shaped the assessment pathway, and the rationale for the integrated approach adopted across all technical assessments which support the two development applications.

Please do not hesitate to contact us should further detail or clarification be required.

Yours sincerely

Elise Campbell
Senior Environmental Engineer
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Bushfire Hazard Assessment and Management Plan

Northern Quartz Campus

Prepared for EMM Consulting

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In preparing this report we have assumed that all information and documents provided to us by the Client, or as a result of a specific request or enquiry, were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

In this note, a reference to loss and damage includes past and prospective economic loss, loss of profits, damage to property, injury to any person (including death) costs and expenses incurred in taking measures to prevent, mitigate or rectify any harm, loss of opportunity, legal costs, compensation, interest and any other direct, indirect, consequential or financial or other loss.

Document Records – Quality

TITLE	Bushfire Hazard Assessment and Management Plan for Northern Quartz Campus and Transmission Line
FILED AS	PR25087_BHAMP_ Northern Quartz Campus (Package 1)_Ver B

Revision	Date	Revision Details	Prepared by (initials)	Reviewed by (initials)	Approved by (name/title)
Version A	17/07/2025	Draft Report	MI	JA	Client
Version B	29/08/2025	Final	MI	JA	Client

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Acronyms and Glossary

Terms	Definitions
AEP	Annual exceedance probability
AFDRS	Australian Fire Danger Rating System
AO	Acceptable outcomes
APZ	Asset Protection Zone
AS3959:2018	Australian Standard AS3959:2018 Construction of Buildings in Bushfire-Prone Areas
Assessment area	The assessment area includes the premises and all land within 150 m of the premises
BAL	Bushfire Attack Level
BHA	Site-specific bushfire hazard assessment
BHAMP	Bushfire Hazard Assessment and Management Plan
BMP	Bushfire Management Plan
BoM	Bureau of Meteorology
BPA	Bushfire Prone Areas
BRC Technical Guide	Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience – Bushfire' October 2019
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwth)
DETSI	Department of the Environment, Tourism, Science and Innovation (Qld)
DILGP	Department of Infrastructure, Local Government, and Planning (Qld)
DNRMMRRD	Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (Qld)
DSDIP	Department of State Development, Infrastructure and Planning (Qld)
ERP	Emergency Response Plan
FBI	Fire behaviour index
FFDI	Forest fire danger index
FPAA	Fire Protection Association Australia

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FZ	Flame zone (Bushfire Attack Level)
GIS	Geographic information system
GTRE	Ground-truthed regional ecosystem
ha	Hectare
HSE	Health Safety and Environment
IMS	Interactive mapping system
IPA	Inner Protection Area
kW/m	Kilowatts per metre
kW/m^2	Kilowatts per metre squared
LEIP	Lansdown Eco-Industrial Precinct
m	Metres
m^2	Metres squared
mm	Millimetres
NCC	National Construction Code 2022
NQC	Northern Quartz Campus
OPA	Outer protection area
PFI	Potential fireline intensity
PFL	Potential fuel load
PO	Performance outcome
Project / Proposed development	The overall action being undertaken including development activities, services, access tracks, and associated infrastructure. It covers the entire range of work and activities necessary to achieve the Project's goals.
Project area	The geographical boundary within which the Project is located. This includes the specific properties, lots, and plans where the Project is being carried out.
Premises	The area directly being assessed and encompasses all land affected by construction activities, buildings, and infrastructure.
QDC	Queensland Development Code
QFD	Queensland Fire Department (formerly Queensland Fire and Emergency Services (QFES))
QFES	Queensland Fire and Emergency Services (now the Queensland Fire Department (QFD))

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Qld	Queensland
QSpatial	Queensland spatial catalogue
RE	Regional ecosystem
RFSQ	Rural Fire Service Queensland
RoL	Reconfiguration of the lot
RVM	Regulated Vegetation Management
SARA	State assessment and referral agency
SDAP	State development assessment provisions
SPP	State Planning Policy
SPP guidance	SPP State interest guidance material – Natural Hazards, Risk and Resilience – Bushfire
SQP	Suitably Qualified Person
t/ha	Tonnes per hectare
TCC	Townsville City Council
VM Act	*Vegetation Management Act 1999* (Qld)

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1 Introduction

1.1 Background

Green Tape Solutions was engaged by EMM Consulting on behalf of Solquartz Pty Ltd (Solquartz) to undertake a bushfire hazard assessment and management plan (BHAMP) as part of the Northern Quartz Campus (NQC) project (the 'project'). The project is located within the TCC's Lansdown Eco-Industrial Precinct (LEIP) at Bidwilli Road, Woodstock, a high impact industrial area promoted as Australia's first environmentally sustainable industrial hub that will power and provide metallurgical silicon and polysilicon. NQC encompasses four major project components that will be sited within the project area and comprising of:

- Package 1 – Battery energy storage system (BESS), transmission line and substation
- Package 2 – Biochar processing facility
- Package 3 – Metallurgical silicon plant and biochar processing facility
- Package 4 – Polysilicon plant

This report addresses the requirement for a BHAMP (Package 1) within three allotments (part of Lot 19 on SP321818, Lot 34 on E124242 and part of Lot 87 on RP9111426). It includes the assessment of the BESS storage component, substation and associated construction facilities. The proposed project is outlined in detail in **Appendix 1**.

The development has been designed to utilise existing cleared areas; however, some vegetation removal will be required as part of the development stages.

The proposed development area is located within mapped bushfire prone area under the Queensland (Qld) State Government State Planning Policy (July 2017) (SPP) mapping for Natural Hazards, Risk and Resilience State Interest (Bushfire), which acts as a trigger for assessment against the SPP assessment benchmarks.

The site is also subject to the Bushfire Hazard Overlay under the Townsville City Plan 2014. This report has been prepared to inform preparation of a Development Application for a Material Change of Use (MCU) and provide guidance on bushfire hazard and risk management for the proposal.

1.2 Project Area Description

Table 1 provides property details and development related information that applies to the project area. The project area is located on across three lots comprising an area of approximately 3,392,000m^2 (339.2 ha) within the Townsville City Council (TCC) LGA (**Figure 1**).

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Table 1: Property Information

Address	132 Bidwilli Road Calcium QLD
Lot / Plan	Lot 19 SP321818, Lot 87 RP911426 and Lot 34 E124242
Area	3,392,000m2 (339.2 ha) approx
Local Government Area (LGA)	Townsville City Council
Zone	High impact industry
Precinct	Landsdown High Impact Industry
Neighbourhood Plan	Not applicable

The premises is located off the Flinders highway from the western boundary, bordered by ghost gum road along the northern boundary and Bidwilli road (a private property road) beyond the southern boundary.

The area has been historically cleared and is utilised as a cattle station. The paddock has been highly modified and cleared for grazing purposes and it now unmanaged open grassland, with several existing infrastructure present (water tanks, remnant sheds).

Access to the premises for vehicles is currently provided via two entry points from the Flinders highway onto Bidwilli road (ungated and accessible) and existing tracks from Manton quarry road (gated and not currently accessible). Several other mapped tracks along the train line at the eastern boundary and ghost gum road no longer exist or are inaccessible.

The project area supports small patches of native vegetation that forms part of an extensive patch of open grassland that is contiguous towards southern boundary. A more detailed description of the vegetation communities within and surrounding the project area is provided in **Section 3.1.2**.

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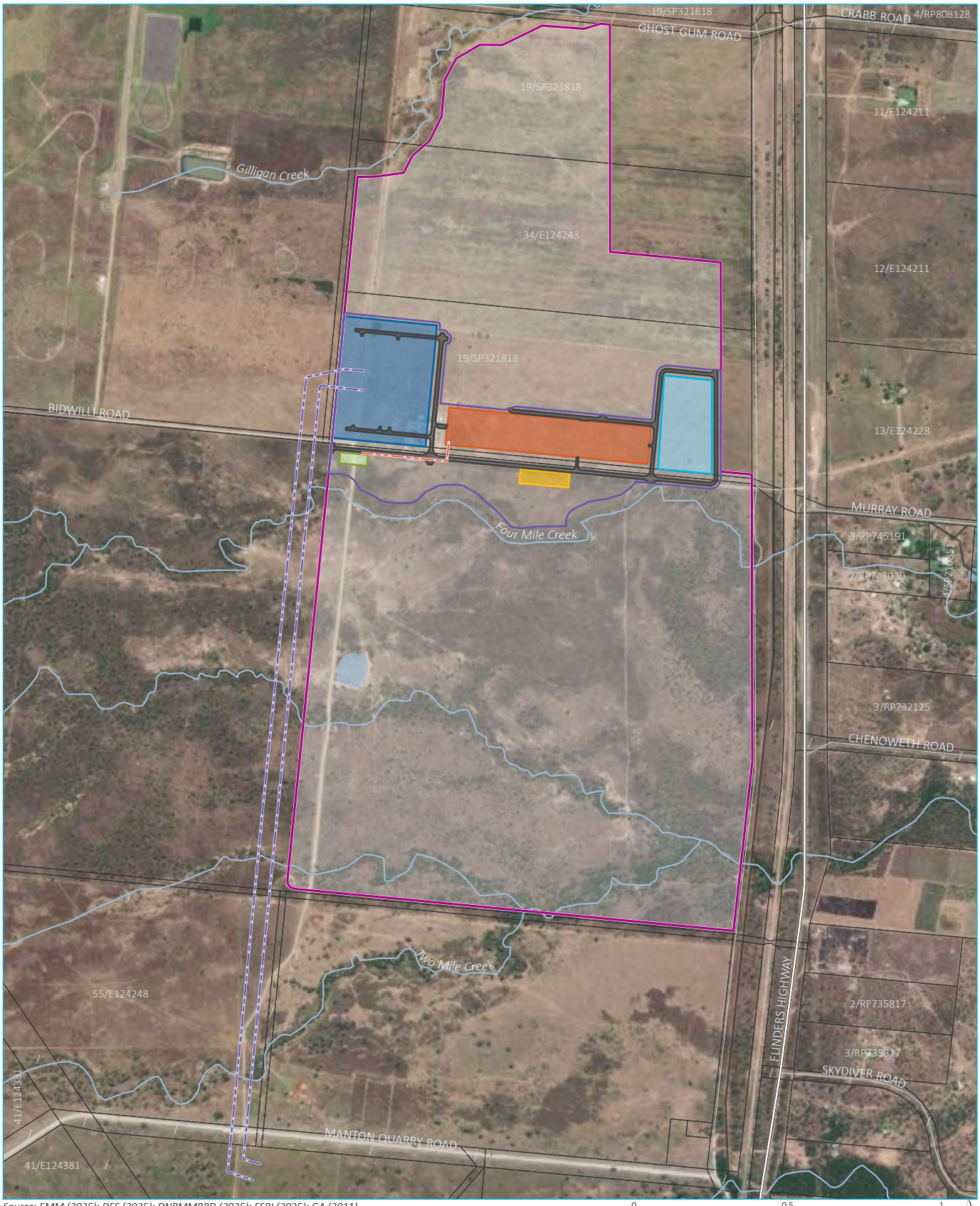
Figure 1: Project Area Location (Source: EMM Consulting, DES 2024)



Source: EMM (2025); DES (2025); DNRMMRRD (2025); ESRI (2025); GA (2011)

0 0.5 1 km

GDA2020 MGA Zone 55

N

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KEY

- Northern Quartz Campus
- Package 1- Premises

Existing environment

- Major road
- Minor road
- Watercourse/drainage line
- Waterbody
- Cadastral boundary

Package 1 proposed site layout

- BESS
- Substation
- Construction laydown area
- Water management area
- Fire water pad
- Internal road
- Transmission line
- Fire water pipeline

DRAFT

Proposed site layout

Northern Quartz Campus
Package 1- BESS, transmission line and substation
Planning Assessment Report
Figure 3.1

EMM creating opportunities

1.3 Scope of Work

The purpose of this BHAMP is to provide a site-specific assessment of bushfire hazard and to assess compliance of the proposed development with the assessment benchmark and outcomes sought by the SPP and the Townsville City Plan 2014 (version 2024/01); in particular, the assessment benchmarks outlined in the Townsville City Plan 2014 (version 2024/01) Bushfire Hazard Overlay Code and Mitigation Bushfire Hazard Planning Scheme Policy (SC6.8).

The BHAMP also provides a plan for bushfire hazard and risk management, including building construction requirements, asset protection zones, fuel management, access requirements, and emergency response measures. Recommendations are consistent with legislative requirements to reduce the risk to life and property.

1.4 Qualifications and Experience

The Queensland Fire and Emergency Services (QFES) *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience – Bushfire' October 2019* ('BRC Technical Guide') (QFES, 2019) provides important guidance on people suitably qualified (Suitably Qualified Person, (SQP)) to undertake assessments identified in the BRC Technical Guide.

Following recent legislative updates and extensive reviews aimed at strengthening disaster management and emergency response capabilities, QFES has transitioned to the newly established Queensland Fire Department (QFD). These changes aim to enhance the State's resilience and responsiveness in managing bushfire hazards and emergencies.

The BRC Technical Guide continues to serve as a key resource, now reflecting the QFD's technical guidance and policy positions for State agencies, local governments, and practitioners. It supports land-use planning and development activities in areas prone to bushfire hazards.

This guidance includes the following recommendations:

- Fine-scale assessment of vegetation communities in accordance with the 'Vegetation Hazard Class' assessment methodology be undertaken by a SQP with experience in botanical survey methods; and
- Applicant-initiated assessments and reports be prepared or peer-reviewed by SQP/s with degree (AQF Level 8) qualifications in environmental science, environmental management (or an equivalent discipline), demonstrated experience in botanical surveys and spatial analysis methods, including use of geographic information systems (GIS) software; demonstrated experience in the assessment of bushfire hazards and risks or technical qualifications in environmental science, environmental management (or an equivalent discipline), and demonstrated relevant industry experience in the assessment of bushfire hazards and risks for a minimum of five (5) years.

This report has been prepared and/or reviewed by a Senior Ecologist from Green Tape Solutions (the SQP) who meets Council and QFD's criteria as follows:

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- The SQP possesses knowledge and experience in applying relevant legislation, plans, policies, standards and guidelines relating to bushfire hazard and fire ecology relating to North Queensland requirements and conditions;
- The SQP has extensive experience in botanical survey methods and GIS analysis and at least five (5) years' experience in undertaking bushfire hazard assessment and preparing bushfire management plans, including experience in undertaking fine-scale assessment of vegetation communities and application of the QFD Bushfire Hazard Assessment methodology outlined in the BRC Technical Guide; and
- The SQP has qualifications and experience in the field of ecology, environmental management or similar to assess and protect site-based and strategic biodiversity values relating to North/Central Queensland.

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2 Bushfire Regulatory Framework

Given that bushfire hazards can cause harm to people and social well-being, damage to property and impact the economy and environment, the management of bushfire hazards in Queensland is considered an integral component of land use planning and development decisions.

The following mechanisms/instruments that apply to, or regulate development, to avoid and mitigate potential impacts associated with bushfire hazards are applicable to the project:

- National Construction Code 2022 (NCC)
- State Planning Policy (SPP) and associated guidelines (Department of Infrastructure, Local Government and Planning (DILGP), July 2017);
- Townsville City Plan 2014 (version 2024/01); and
- Australian Standard AS3959:2018 – Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018).

2.1 National Construction Code

The NCC sets out requirements for the design and construction of a building in Australia, including minimum required levels for the safety of certain buildings. The NCC contains additional requirements for the construction of buildings in designated bushfire-prone areas to address additional risks posed by bushfire attacks. The NCC is given legal effect through the *Building Act 1975* (Qld) and is varied through amendments to the Building Regulation 2006 that adopts the Queensland Development Code (QDC). Queensland governments DA Mapping System (DAMS) identifies bushfire-prone areas for the NCC, the Building Regulation 2006 and the QDC.

2.2 State Planning Policy (SPP)

The SPP identifies the Queensland Government's policies about matters of state interest in land use planning and development (DILGP, July 2017). The SPP is a broad statutory planning instrument. It sits above regional plans, standard planning scheme provisions and local government planning schemes within the hierarchy of planning instruments outlined in the *Planning Act 2016*.

The following guidance material supports the SPP:

- The SPP State interest guidance material – Natural Hazards, Risk and Resilience – Bushfire ('SPP guidance') (DSDMIP, 2019), which provides further context to the SPP and explains how the SPP policies can be applied, in particular for local government when making or amending local planning instruments. The SPP guidance is also intended to assist assessment managers and practitioners in applying the SPP assessment benchmarks when State interests have not been integrated into the local planning scheme (where applicable).
- The 'BRC – Technical Reference Guide for the State Planning Policy State Interest – Natural Hazards, Risk and Resilience – Bushfire ('BRC Technical Guide') (QFES, 2019), which provides technical guidance and policy positions of the QFD (formerly the QFES). It includes procedures for undertaking a bushfire hazard assessment (BHA), calculating asset protection zones (APZ) and preparing a Bushfire Management Plan (BMP).

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The SPP assessment benchmarks outlined in Part E of the SPP and Section 4.0 of the SPP guidance apply to development to the extent that the development is assessable against a planning scheme and only to the extent that the planning scheme is inconsistent with the SPP.

The SPP is also supported by a state-wide map of bushfire-prone areas (BPA) (also referred to as 'bushfire hazard area') that was developed based on the Commonwealth Scientific and Industrial Research Organisation (CSIRO) modelling of potential fireline intensity (PFI) using the methodology described by Leonard *et al.* (2014). The SPP defines a BPA as land that is potentially affected by significant bushfires, including vegetation likely to support a significant bushfire and adjacent land that could be subject to impacts from a significant bushfire (i.e. potential impact buffer) and is:

(a) Identified by a local government in a local planning instrument as a bushfire prone area based on a localised bushfire study, prepared by a suitably qualified person; or

(b) If the local government has not identified bushfire prone areas in a local planning instrument in accordance with (a) above, shown on the SPP Interactive Mapping System (SPP IMS) as a bushfire prone area.

The BPA mapping identifies areas of Very High (>40,000 kilowatts per metre (kW/m)), High (20,000 – 40 000 kW/m) and Medium (4,000 – 20,000 kW/m) Potential Bushfire Intensity. The Potential Impact Buffer includes all land within 100 metres (m) of any area with a PFI greater than 4,000 kW/m (i.e., within 100 m of Medium, High or Very High bushfire hazard/potential bushfire intensity). This mapping triggers assessment against the SPP Assessment Benchmarks.

An excerpt from the SPP Assessment Benchmark – BPA mapping published on the SPP Interactive Mapping System (IMS) is provided in **Figure 2**. The project area is mapped to contain areas of Medium Potential Bushfire Intensity and Potential Impact Buffer to the south, southeast and north of the site.

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Date: 27/08/2025

DA Mapping System - Export Map

Disclaimer This map has been generated from the information supplied to the Queensland Government for the purposes of the Development Assessment Mapping System. Note that this is a print screen only . The map generated has been prepared with due care based on the best available information at the time of publication. The State of Queensland holds no responsibility for any errors, inconsistencies or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties. This information is supplied subject to the full terms and conditions available on the department's website.

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Scale: 1:9,100

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Metres

Queensland Government

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Queensland Government

Figure 2: Excerpt from DSDMIP SPP IMS – Bushfire Prone Area (Source: DSDMIP SPP IMS)

2.3 Townsville City Plan 2014 (version 2024/01)

The project area is located within the Townsville City LGA and is subject to the provisions of the Townsville City Plan 2014 (version 2024/01). The Townsville City Plan 2014 (version 2024/01) Bushfire Hazard Overlay maps the project area as containing areas of Medium Potential Bushfire Intensity and Potential Impact Buffer. An excerpt from the overlay map identifying the mapped bushfire hazard areas in relation to the site is shown in **Figure 3**.

The Townsville City Plan 2014 (version 2024/01) Bushfire Hazard Overlay Code requires that development addresses the bushfire hazard determined by a site-specific BHA based on vegetation existing within, adjacent to, and near the premises, including any areas subject to, or likely to be subject to, ecological restoration (e.g., Council waterway corridors), revegetation or regrowth, which are to be assessed as if these areas have reached their mature state.

The Townsville City Plan 2014 - Mitigating Bushfire Hazard Planning Scheme Policy (Bushfire PSP) provides guidance and advice regarding the preparation of a bushfire hazard assessment and management plan. The Bushfire PSP specifies the use of the Australian Standard AS3959 (2009) and State Planning Policy and supporting guidelines to prepare a bushfire hazard assessment. This involves identifying the bushfire hazard risks, including site vulnerability, tolerability and developing in mitigation measures, their feasibility and hazard reduction impacts should the site not be classed as a low hazard.

For the purposes of this report, the most recent version of the Australian Standard AS3959 2018 will be used instead of the AS3959 2009 outlined in the Townsville City Plan 2014 as the version specified in the local council Bushfire PSP is outdated.

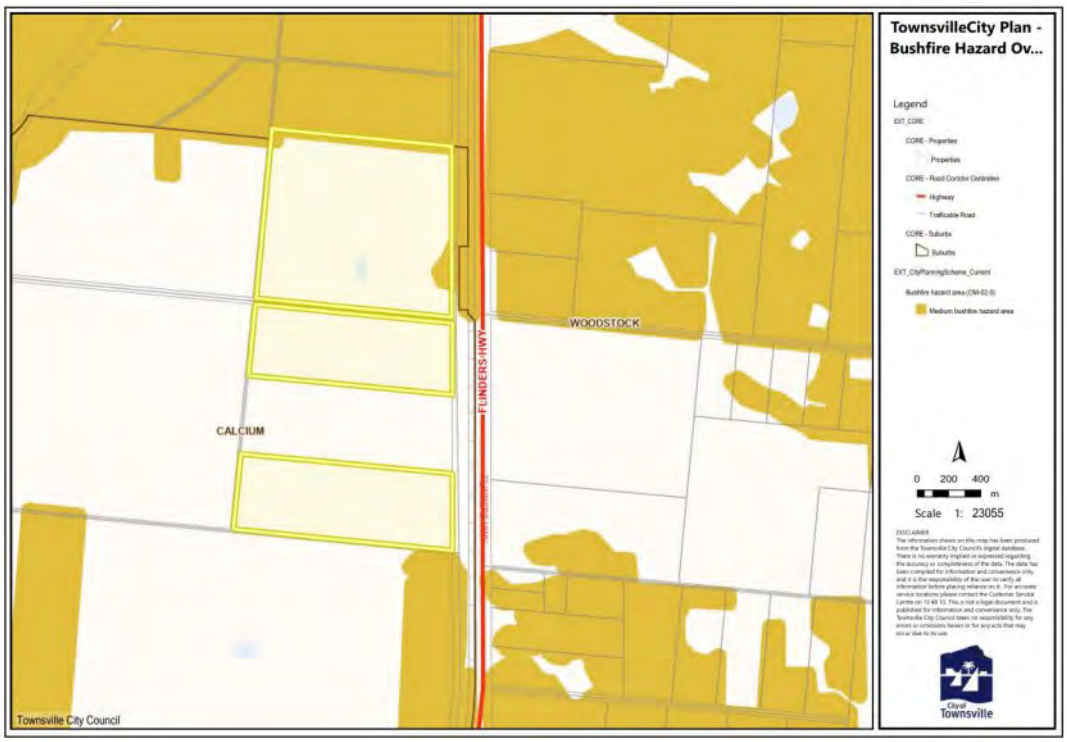

Figure 3: Excerpt from Townsville City Plan 2014 – Bushfire Hazard Overlay (Source: TownsvilleMAPS, 2025)

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2.4 AS3959:2018 Construction of Buildings in Bushfire Prone Areas

The Australian Standard *AS3959:2018 Construction of Buildings in Bushfire-Prone Areas* (Standards Australia, 2019) specifies the requirements for the construction of buildings in bushfire-prone areas in order to improve their resistance to bushfire attack. AS3959:2018 applies to those areas where a regulated map (i.e., a planning scheme overlay map) identifies an area as a BPA (or similar), requiring calculation of Bushfire Attack Level (BAL) in accordance with a methodology outlined in the standard.

AS3959:2018 thus prescribes the construction details for buildings depending on the calculated BAL. The detailed requirements relating to construction methods and materials are typically dealt with as part of building design and enabled via private certification in accordance with the NCC.

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3 Bushfire Hazard Assessment

The site-specific BHA provided in this plan has been undertaken in accordance with the current State-endorsed methodology outlined in the BRC Technical Guide. This methodology utilises the method for calculating PFI outlined in Leonard *et al.* (2014), based on the McArthur (1967) forest fire behaviour model and Byram's fireline intensity (1959). Where required, radiant heat flux modelling has been undertaken utilising Method 2 of the Australian Standard AS3959:2018 – Construction of Buildings in Bushfire Prone Areas.

The methodology underpinning this BHA process consists of three stages:

1. A desktop assessment to verify the reliability of existing BPA/Bushfire Hazard Overlay mapping over the project area and land surrounding the premises.
2. A hazard assessment involving field investigations to ground-truth the accuracy of the BPA/Bushfire Hazard Overlay mapping for the premises, where required. The hazard assessment area must include the premises and all land within 150 m of the premises (the 'assessment area').
3. Using the results of the site-specific assessment, the APZ width needed to achieve the requisite radiant heat flux levels is calculated using the SPP Bushfire APZ width calculator or Method 2 of AS3959:2018.

Where the precision and/or accuracy of BPA mapping or map input datasets are insufficient (e.g., where there has been changes in land use and vegetation cover within the assessment area or where site-verified Vegetation Hazard Classes (VHCs) have been confirmed to be inconsistent with the mapped VHCs), the process enables applicants to create a local-scale BPA map based on the results of the site investigation and to apply modified input variables that reflect changes that have occurred over time.

The BHA process adapts the method used to generate the state-wide BPA mapping, described in Leonard *et. al.* (2014) with further refinement to allow for the downgrade and/or filtering of small patches and narrow corridors where needed in accordance with contemporary mapping rules outlined in the BRC technical guide and Leonard and Opie (2017).

Where effective fuel loads have been reduced based on patch size and isolation in accordance with the patch and corridor filtering rules outlined in 4.2.6 of the BRC Technical Guide, reduced effective fuel loads can be used as inputs into a Method 2 BAL assessment.

The assessment has been based on vegetation existing within, adjacent to, and nearby the site including any areas subject to revegetation or regrowth, which have been assessed as if these areas have reached their mature state.

A site visit was undertaken by an Ecologist from Green Tape Solutions on 8th-9th May 2025 to verify the reliability of existing BPAs/Bushfire Hazard Overlay mapping, determine the extent of the BPAs/Bushfire Hazard Overlays and the level of risk to which the development is exposed.

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Field investigations involved site-based verification of factors affecting bushfire hazard and risk within the defined assessment area, including a site-specific botanical survey to ground-truth vegetation communities within and surrounding the project area to support a VHC assessment in accordance with the methodology outlined in the BRC Technical Guide.

The field investigations also included identification of existing firebreaks and management lines and confirmation of premises and effective slopes.

3.1 Hazard Assessment

The following steps have been undertaken to assess spatial factors that contribute to potential bushfire intensity for the project area and surrounding land:

- **Step 1: Identification of Fire weather severity**

  Identification of all Forest Fire Danger Index (FFDI) values estimated at a 1:20 year (5%) Annual Exceedance Probability (AEP) using the Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset from the Queensland Spatial catalogue (QSpatial).

- **Step 2: Identification of Vegetation Hazard Classes**

  Assessment of vegetation communities to identify the relevant VHCs using a combination of remnant and pre-clearing regional ecosystem (RE) maps, high-resolution aerial imagery, and a ground-truthed assessment of vegetation present within the project area and within the required assessment area.

- **Step 3: Slope assessment**

  Identification of premises slope and effective slope, and determination of whether proposed buildings are upslope or downslope of hazardous vegetation using Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset from QSpatial and 1 m LiDAR-derived contour data.

- **Step 4: Remodelling of bushfire hazard and calculation of potential fireline intensity**

  Where a change to the distribution, extent and/or classification of VHCs within the assessment area is proposed, remodelling of bushfire hazard is undertaken to determine how the changes to VHCs and associated fuel loads affect PFI. PFI is to be calculated in accordance with the method outlined in Leonard *et. al.* (2014).

VHCs and associated potential fuel loads (PFL) are in accordance with Leonard *et al.* (2017), as provided in the BRC Technical Guide and SPP Bushfire APZ width calculator published by the QFD.

Relevant spatial datasets published by the QFD were accessed via QSpatial and the Queensland Government Redi Map portal (QFES, 2020).

3.1.1 Step 1 – Fire Weather Severity

North Queensland has a tropical climate with hot, moist summers and warm, dry winters. It is subject to influence from monsoonal climate systems and easterly troughs. Annual and seasonal average rainfall are variable, affected by local factors such as topography and vegetation, and broader scale weather patterns, such as the El Niño–Southern Oscillation. Seasonality is not pronounced; however, the 'wet' season generally occurs during the November – April period. The fire danger season usually occurs

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from Autumn to Spring (May to October/November) with the greatest danger after a dry winter and spring and when deep, low-pressure systems near Tasmania bring strong, hot and dry westerly winds to the coastal districts (Bureau of Meteorology, 2021). Severe bushfire weather is characterised by days with high temperatures over 35 degrees, low relative humidity and winds from the north to north-west.

The FFDI provides an annual accumulated index of fire weather severity (i.e., the potential danger of a bushfire) based on a combination of vegetation dryness, air temperature, wind speed and humidity. For the purposes of this project, it has been identified as grassfire prone, not bushfire prone, therefore the Grassland Fire Danger Index (GFDI) has been used.

The FFDI for the project area and surrounding land is 59.

The GFDI) provides an annual accumulated index of fire weather severity (i.e. the potential danger of a bushfire) based on a combination of vegetation dryness, air temperature, wind speed and humidity. The relevant GFDI for the project area was derived from the McArthur Grassland Fire Danger Meter Mk5 (**Figure 4**).

The GFDI for the project area and surrounding land is 64.

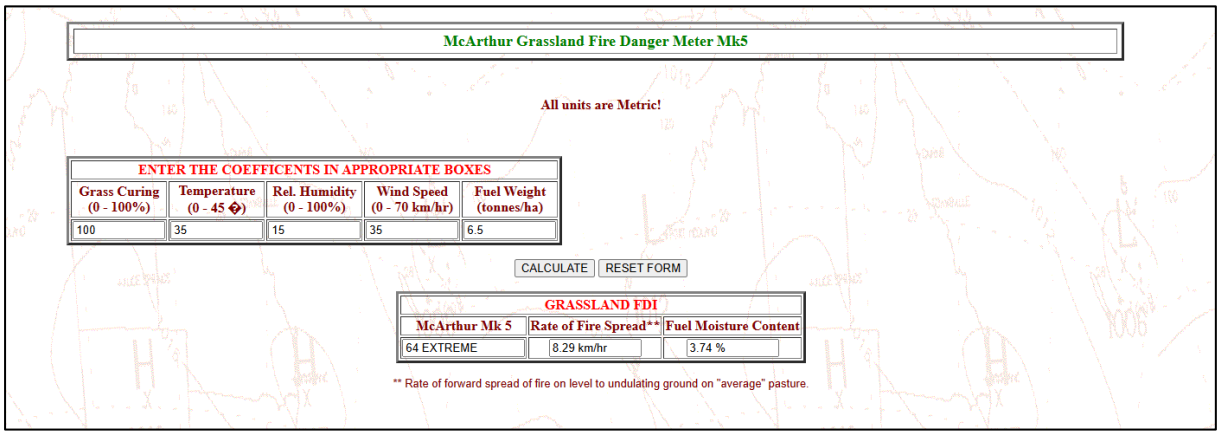

Figure 4: Grassfire Fire Danger Index Output

3.1.2 Step 2 – Vegetation Hazard Classes and Potential Fuel Loads

3.1.2.1 Vegetation Hazard Classes

Different types of vegetation communities determine the rate at which dry fuel accumulates. Some vegetation communities protect fuel from drying out in all but extreme bushfire seasons and can then be susceptible to very destructive bushfires. Alternatively, vegetation communities may expose fuels to drying and therefore be frequently available for burning. Frequent bushfires can result in the development of bushfire-tolerant grassy woodlands or grasslands and less destructive bushfire behaviour.

VHCs provided within the Bushfire Prone Area – Vegetation Hazard Class, Queensland spatial dataset was reviewed for the premises and surrounding land (**Figure 5**). The following VHCs are mapped within the required assessment area:

- 18.2 – Dry eucalypt woodlands on sand or depositional plains (lest concern);

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- 40.4 – Low grass or tree cover in rural areas; and
- 9.2 - Moist to dry eucalypt woodland on coastal lowlands and ranges

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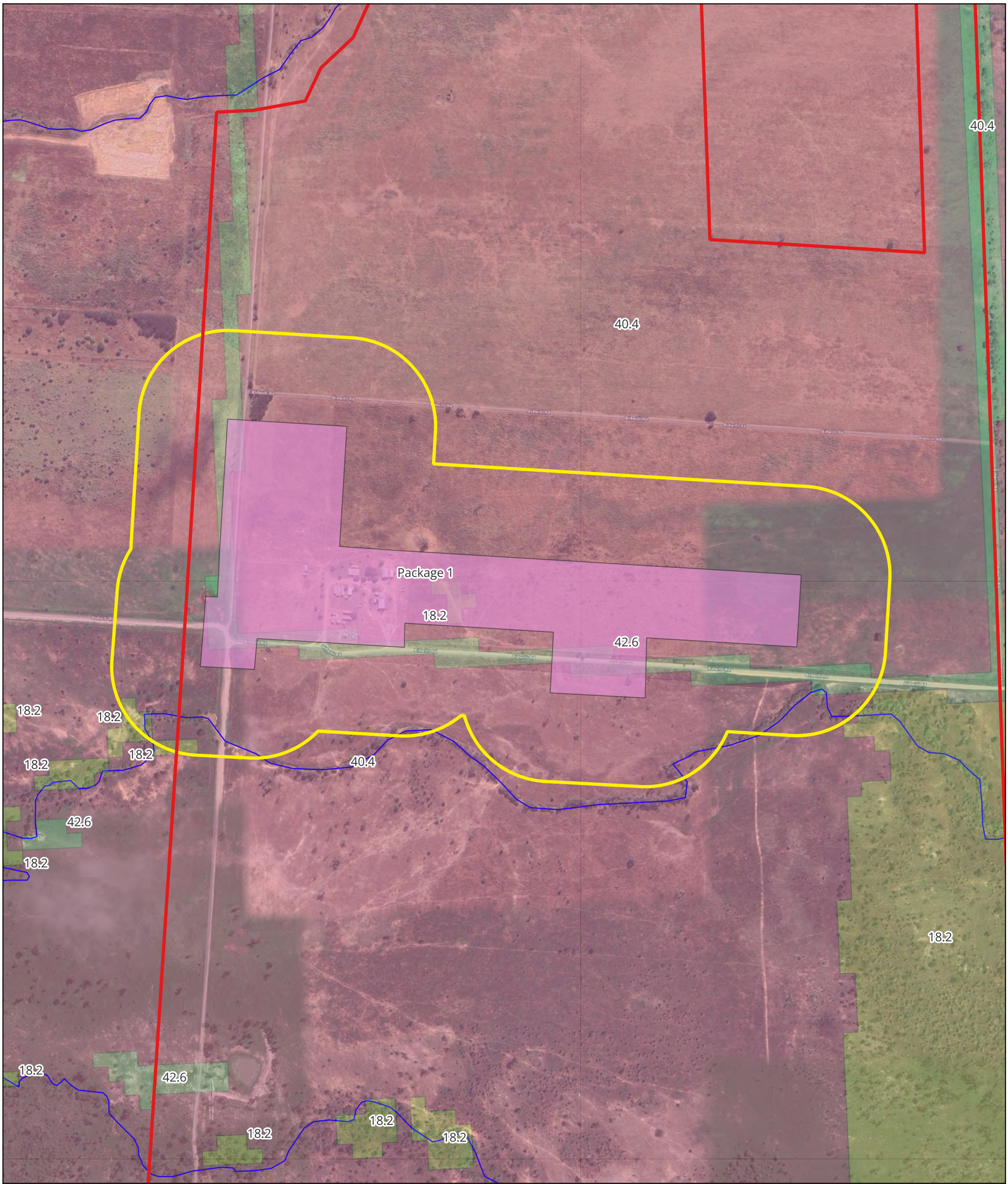

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Figure 5: State Mapped Vegetation Hazard Classes

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Version: 2

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Notes:
- Survey Data by Green Tape Solutions
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Green Tape SOLUTIONS

Legend

Project Boundary

150m buffer

North Qld VHC

18.2 Dry eucalypt woodlands on sand or depositional plains

40.4 Low grass or tree cover in rural areas

42.6 Nil to very low vegetation cover

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The reliability of State-mapped VHCs was assessed through:

- a review of Regulated Vegetation Management remnant and pre-clearing RE mapping published by the Queensland Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (DNRM); and
- an assessment of existing vegetation undertaken by Green Tape Solutions on 8th to 9th May 2025 as part of site investigations to support preparation of a BHAMP.

DNRM's remnant RE mapping shows that the assessment area contains non remnant vegetation. Pre-clearing RE mapping infers that the project previously supported least concern RE 11.3.30 and RE 11.3.35 (**Figure 6**).

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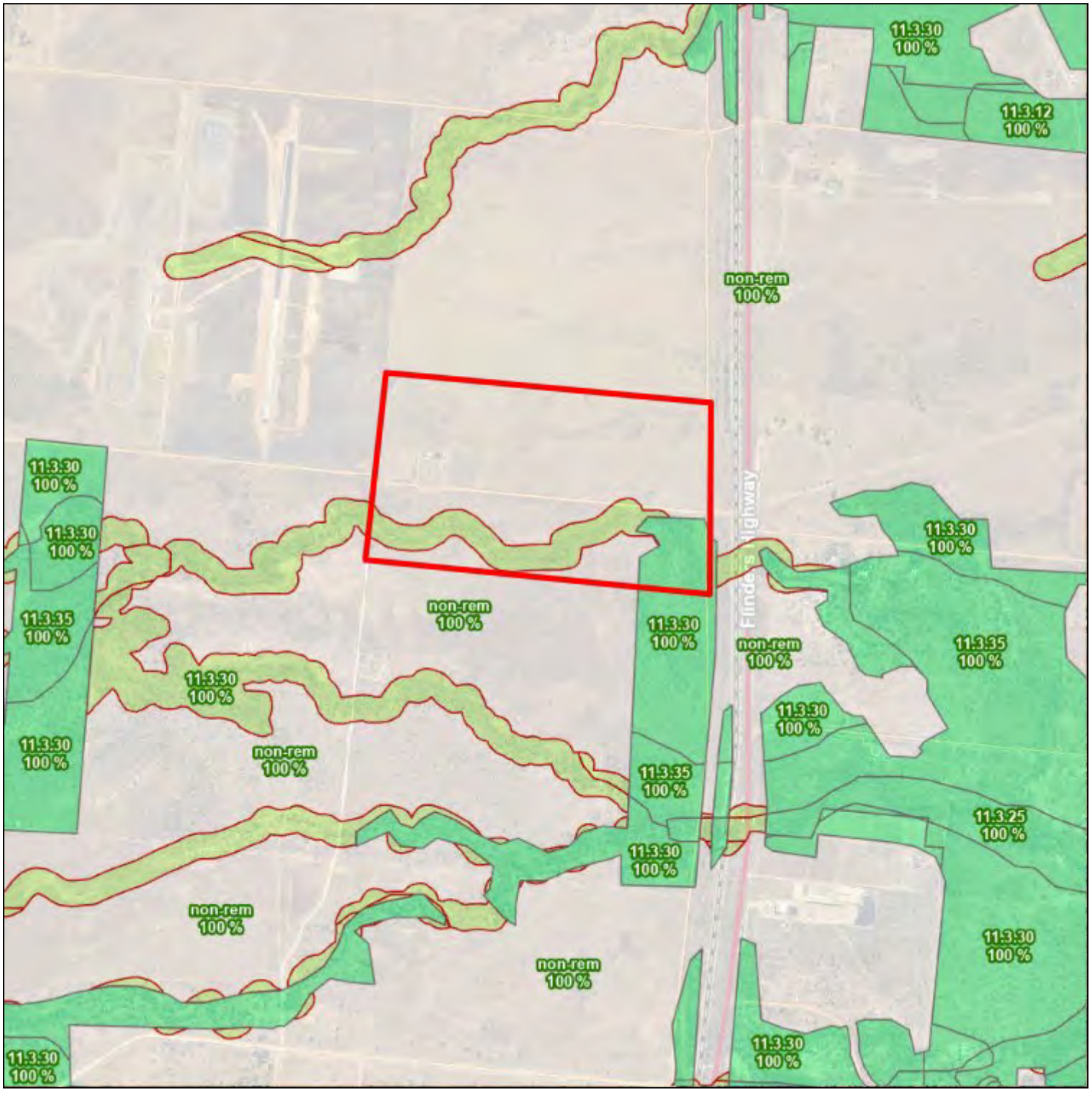
Northern Quartz Campus

Lot 19 SP321818, Lot 34 E124243 and Lot 87 RP911426

19°36'51"S 146°48'31"E

19°36'51"S 146°50'57"E



19°39'8"S 146°48'31"E

19°39'8"S 146°50'57"E

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Queensland Globe

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Scale: 1:22690

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Print date: 27/8/2025

Not suitable for accurate measurement.

Projection: Web Mercator EPSG 102100 (3857)

For more information, visit https://qldglobe.information.qld.gov.au/help-info/Contact-us.html

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Queensland Government

Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development

The site assessment determined that vegetation within the assessment area consists of primarily Category X non remnant vegetation and an area of regrowth Category R vegetation along the unnamed watercourse south of the site. These vegetation communities can be described as:

- historically cleared areas that currently unmaintained and highly disturbed with high level of weed cover;
- native woody regrowth vegetation comprising dry eucalypt open forest along watercourses; and
- cleared areas for the development, residential use and rural roads.

The site assessment verified the presence of the following VHCs within the assessment area:

- 18.2 – Dry eucalypt woodlands on sand or depositional plains;
- 40.4 – Low grass or tree cover in rural areas; and
- 41.4 – Discontinuous low grass or tree cover

Native (Category R) regrowth vegetation within the assessment area occurs along the watercourse beyond the southern boundary of the premises. The premises has been highly impacted and modified by cattle and grazing industries, with environmental weeds dominating vegetation cover across the assessment area.

Figure 7 depicts the location of the ground-truthed VHCs within the assessment area.

Vegetation Community 1 – Contiguous open grassland with dry eucalypt open forest.

Vegetation within the area north of Bidwilli road will be cleared and is mapped as Category X non remnant vegetation. This community north of Bidwilli Road within lot 19SP321818 is dominated by exotic herbs and grasses consisting of sicklepod (*Senna obtusifolia*), prickly sida (*Sida spinosa*), parrot leaf (*Alternanthera ficoidea*), grader grass (*Themeda quadrivalvis*), blue billy goat weed (*Ageratum houstonianum*) and purple-top chloris (*Chloris barbata*). Scattered regrowth trees border the fence line including narrow-leaved ironbark (*Eucalyptus creba*) and Broad-leaved paperbark (*Melaleuca viridiflora*).

The vegetation hazard class of this vegetation community aligns with VHC 40.4 Low grass or tree cover in rural areas. Most of the species present (>90%) are woody herb and grass weed species with small patches of tussock grassland present.

Vegetation Community 2 - Native woody regrowth vegetation comprising dry eucalypt open forest along watercourses

Vegetation along the unnamed watercourse south of Bidwilli Road is like Vegetation Community 1, with lower densities. It mainly consists of jaragua grass (*Hyparrhenia rufa*) and blue billy goat weed (*Ageratum houstonianum*), with broad-leaved paperbark (*Melaleuca viridiflora*) and ghost gum (*Corymbia aparrerinja*) present along the creek line within Category R vegetation. This community spans roughly 20-30m wide across the south of the BESS.

Sparse, scattered trees with dense undergrowth of invasive herbs and grasses characterize most of the area. A discontinuous canopy layer, approximately 20m wide, is found near the watercourse, bordered by regrowth trees along Bidwilli Road. The canopy height ranges from 6-8m, averaging 7m, with 20%

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crown cover. This community matches RE 11.3.30 – narrow-leaved iron-bark (*Eucalyptus crebra*), *COMMON NAME* (*Corymbia dallachyana*) woodland on alluvial plains and is classified as Category R regrowth vegetation, aligning with VHC 18.2 Dry eucalypt woodlands on sand or depositional plains.

A larger section, about 2.8 ha, east of the development is outside the assessment area and surrounded by open grassland similar to Vegetation Community 1.

Vegetation Community 3 - Cleared areas for the development, residential use and rural roads

Vegetation about the BESS, rural dwellings, dwellings and roads are treated as cleared land for and have few if any vegetation cover. These areas are categorised as VHC 42.6 Nil to low vegetation cover.

Plate 1: Vegetation Community 1 – tussock grassland (north facing)

Plate 2: Vegetation Community 1 – tussock grassland (northwest facing)

Plate 3: Vegetation Community 1 – tussock grassland (south facing)

Plate 4: Vegetation Community 1 – creek present near the BESS (southeast facing)

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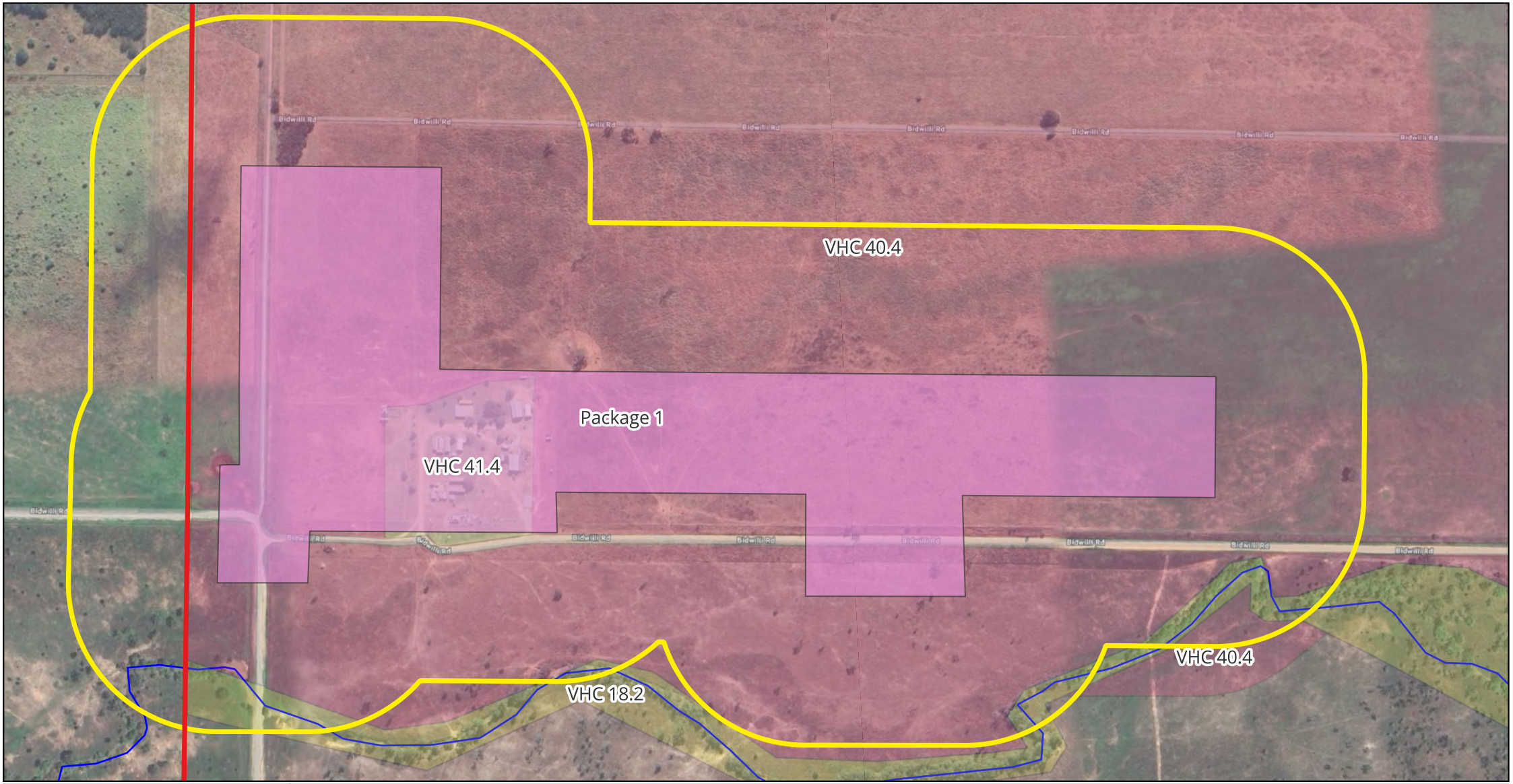

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Figure 7: Ground-Truthed Vegetation Hazard Classes

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Version: 2

Project Reference - **PR25087**

Notes:
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Legend

150m buffer BESS

Ground truthed VHCs

- VHC 18.2
- VHC 40.4
- VHC 41.4

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3.1.2.2 Potential Fuel Loads

Fuel loads have been allocated for each VHC to represent the long-unburnt condition that would be typically exhibited ten (10) years after fire. In accordance with the values provided in Figure 14 of the BRC Technical Guide, the PFL values (in tonnes per hectare (t/ha)) for ground-truthed VHCs within and surrounding the site are provided in **Table 2**.

Table 2: Potential Fuel Loads for Classified Vegetation within the Assessment Area

VHC		Total Potential Surface Fuel Load (t/ha)	Total Overall Potential Fuel Load (t/ha)	Prone Type[1]		Fuel Continuity[2]	
18.2	Dry eucalypt woodlands on sand or depositional plains	10.4	11.0	1	Forest or shrub fire	1	discontinuous
40.4	Low grass or tree cover in rural areas	5.7	6.5	2	Grassfire Prone – Grassland Fires (Not Bushfire Prone)	1	continuous

The site assessment revealed fuel loads higher than the BRC guideline of 5 t/ha for VHC 40.4, due to extensive exotic grasses and weeds. An additional 1.5 t/ha was added to the overall potential fuel load as specified in Figure 14 of the BRC Technical Guide, reflecting the overgrown state. Data from the QLD Government's Long Paddock mapping indicated moderate grassfire risk, with pasture growth of 200-500 kg DM/ha in the past three months. A higher end estimate was applied conservatively to account for the unmanaged condition of the VHC.

In accordance with Section 7.6 of the BRC Technical Guide, fireline intensity, radiant heat flux and BAL is not required to be calculated for non-bushfire prone (i.e., grassland VHCs with a prone type of 2) or low hazard VHCs (i.e., VHCs with a prone-type of 3). VHC 40.4 is not bushfire prone however it has been identified as grassfire prone, therefore it will be included in this hazard vegetation assessment. Additionally, although VHC 18.2 is classed as bushfire prone it will be excluded from the hazardous vegetation assessment as the vegetation has been removed from further assessment as per the patch and corridor filtering rules outlined in **Section 3.1.4** below.

[1] Prone type taken from the VHC_Data sheet of the SPP Bushfire APZ Calculator.
[2] Fuel continuity type taken from Figure 14 of the BRC Technical Guide.

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3.1.3 Step 3 – Site and Effective Slope

Two slope input parameters are required for estimating fire behaviour and determining separation distances: site slope and effective slope. Site slope refers to the slope of the ground between the edge of the proposed development and the edge of hazardous vegetation, while effective slope refers to the slope beneath the hazardous vegetation. Effective slope is the more significant parameter, as it directly influences the potential rate of fire spread, fuel consumption, and the PFI.

For each bushfire-prone VHC, the effective slope is determined by:

1. Measuring the slope beneath classified vegetation (in degrees) that most influences bushfire behaviour, in accordance with Section 5.4.2 (3) of AS3959:2018.
2. Identifying the slope type – the relative position of land supporting hazardous vegetation in relation to the development (i.e., whether the proposed development is upslope or downslope of hazardous vegetation), in accordance with Section 5.4.2 (3) or Clause 2.2.5 of AS3959:2018.

Where there is more than one slope beneath classified vegetation, each slope should be assessed individually, and the worst-case scenario should be adopted. Slope measurements have been calculated using LiDAR-derived 1 m contour data published by the DNRM and verified by site measurement.

The topography of much of the premises and surrounding land to the south is generally flat (between 1-2 degrees) and is deemed to be 'upslope'. The northern portion of the assessment area slopes from ghost gum road to the south-west towards the premises and vegetation along the southern interface of the development area is 'upslope'. The site slope and effective slope for all hazardous vegetation within the assessment area have been calculated and are provided in **Table 3**.

Table 3: Slope Measurements for Assessable Fire Runs to the Premises

Slope Location in Relation to the Premises	VHC	Maximum Effective Slope (Degrees)	Maximum Site Slope (Degrees)	Fire Run in Relation to the Premises	Fire Run Scale
North, southwest, west, east	40.4	-2	-2	Downslope	Fully Developed Fire

3.1.4 Step 4 – Remodelling of Bushfire Hazard

Given that site-specific assessment determined that mapped VHCs provided within the BPA – VHC – North Queensland spatial dataset does not entirely reflect the ground-truthed VHCs, remodelling of bushfire hazard has been undertaken to determine how the changes to VHCs and associated fuel loads affect the PFI. The PFI has been calculated in accordance with the method outlined in Leonard *et. al.* (2014).

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PFI is a standard measure of the rate at which an advancing fire would consume fuel energy per unit time per unit length of the fire front. This metric combines the PFL, maximum landscape slope (slope) and fire weather severity (FFDI) to provide a PFI metric.

The PFI is represented as the following equation:

$$PFI = 0.62\ PFL^2 \times FFDI \exp(0.069 \times slope)$$

Where: PFI = Potential fire line intensity (kW/m), PFL = Potential fuel load (tonnes / ha), FFDI = Potential severe fire weather (FFDI) and Slope = Max slope

Table 4 shows the PFI ranges (in kilowatts per metre (kW/m)) and the corresponding potential bushfire hazard classes.

Table 4: Potential Fireline Intensity Ranges and Bushfire Hazard Classes

Potential Fireline Intensity (kW/m)	Potential Bushfire Hazard Class
40,000+ kW/m	Very high
20,000 – 40,000 kW/m	High
4,000–20,000 kW/m	Medium
0 – 4,000 kW/m	Low/Not Bushfire Prone

Section 4.2.6 of the BRC Technical Guide provides a series of mapping rules ('patch and corridor filtering rules') for modifying the PFI of BPAs to reflect the likelihood of lower PFI in smaller vegetation patches and narrow vegetated corridors. These rules are applied as follows:

1. Remove patches of continuous fuel < 1 ha in area that are surrounded by either no fuel or non-continuous fuel and are further than 100 m from any other continuous fuel greater than 2 ha;
2. Downgrade the effective fuel load of small patches of continuous fuel measuring a. 1 – 2 ha – downgrade by 66% and b. 2 – 3 ha – downgrade by 50 % if the patch is surrounded by either non-continuous fuel or a low-hazard vegetation or land-use type and if the patch is further than 100m from any other continuous-fuel vegetation patch greater than 2 ha;
3. Remove narrow corridors and areas of continuous fuel that are less than 50 m in width; and
4. Remove small fragments of hazardous vegetation of less than 0.5 ha in area. These are downgraded to low hazard.

Based on the results of the site-specific assessment, Vegetation Community 2 within the assessment area meets the patch and corridor filtering rules 3 as identified above and outlined in the BRC Technical Guide (**Figure** 8).

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The narrow corridor of VHC 18.2 along the unnamed creek south of the BESS has been removed using Rule 3 above as it is less than 50 m in width. Due to the extent and proximity of other continuous -fuel patches within the assessment area, a fully developed fire run is possible from the east, south and west and no other rules can be applied to filter out or downgrade continuous fuel patches.

The PFI was calculated for bushfire-prone vegetation within the assessment area of the site using the inputs from Steps 1 – 4. The remodelled PFI for bushfire-prone vegetation within the assessment area are provided in **Table 5.**

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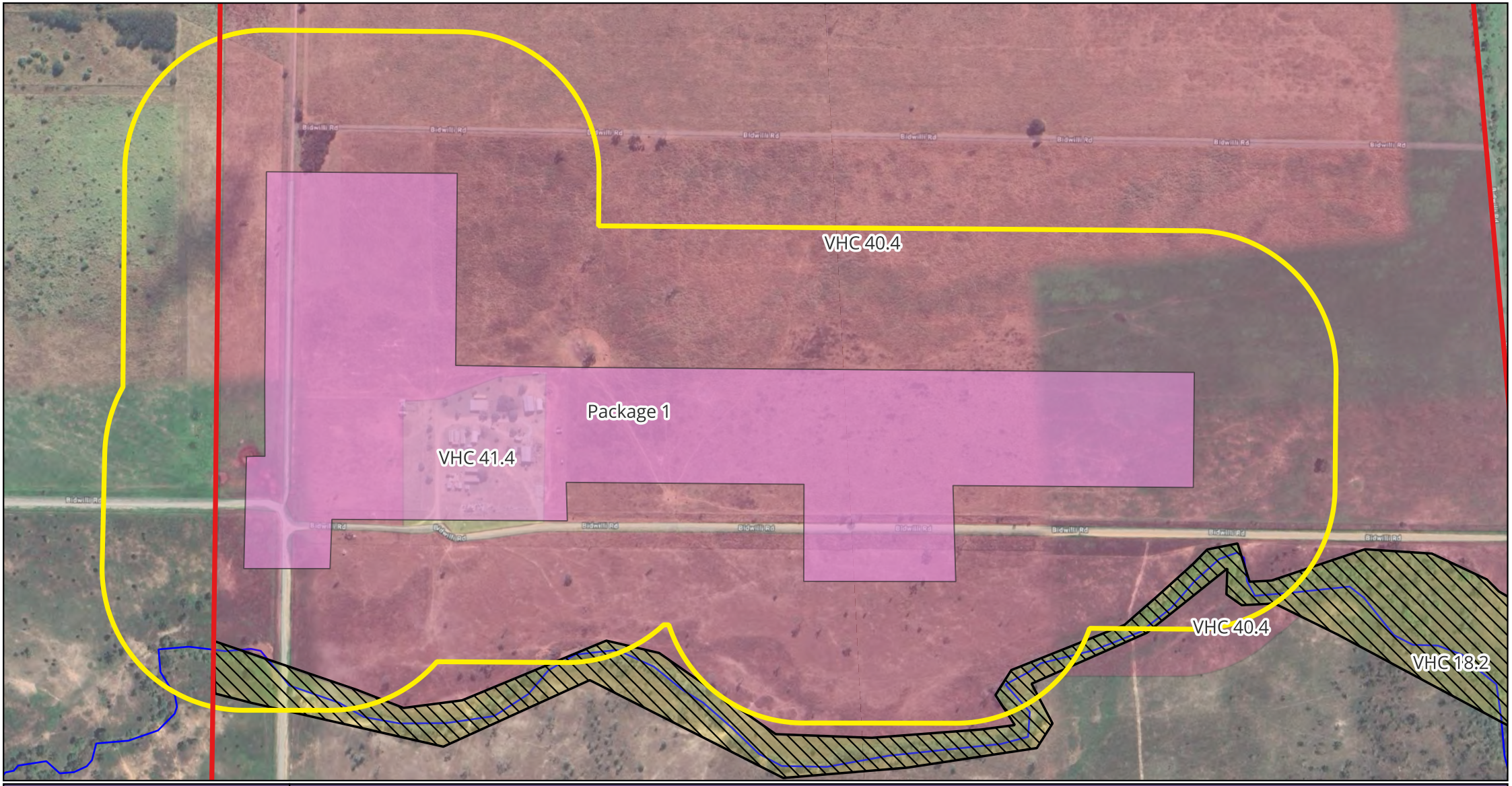

Northern Quartz Campus

Figure 8 - Patch and Corridor Filtering

Created By: MI
Date: 27/08/2025
Version: 2

Project Reference - **PR25087**

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Legend

150m buffer BESS

Ground truthed VHCs

VHC 18.2

VHC 40.4

VHC 41.4

Corridor and Patch filtering

VHC 18.2 - removed under Rule 3

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0 50 100 m

Table 5: Potential Fireline Intensity for Classified Vegetation Hazard Classes within the Assessment Area

Location of Classified Vegetation Relative to the Premises	VHC	Vegetation Status	Effective Slope (Degrees)		Fire Weather Severity (FFDI)	Mapped Potential Bushfire Hazard Class	Potential Fireline Intensity (PFI)	Remodelled Bushfire Hazard Class
North, southwest, west, east	40.4	Non-Remnant	2	Downslope	64	Low	1,640 kW/m	Not BPA

The results of the PFI calculations show that vegetation surrounding the premises is classed as ‘grassfire prone’ not ‘bushfire prone’, therefore a BAL assessment is not required. However, as there is no separation between the grassfire prone vegetation and the development an APZ will still be calculated as there is still a risk of a fully developed grassfire present from the north, west and east.

Given that the site-specific bushfire hazard assessment has confirmed the development area is potentially subject to ‘medium’ grassfire hazard, a bushfire management plan is still required to be developed to mitigate adverse impacts of bushfire. **Section 4** outlines the requirements for management and mitigation of bushfire hazard for the bushfire-prone vegetation within the premises.

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3.2 Radiant Heat Exposure and Bushfire Attack Levels

BALs are used to quantify the levels of attack (radiant heat exposures/flux) that built structures may experience during a fire event. The BAL is defined as *'a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire'* (Standards Australia, 2018).

AS3959:2018 adopts six BAL categories, which are based on the level of radiant heat flux to which buildings may be exposed to during a bushfire event (**Table 6**). This level of heat flux generally relates to the type of vegetation, effective slope, and how far a building is from hazardous vegetation. BALs apply to buildings and any attached or adjacent structure within 6 m of the building.

Table 6: Bushfire Attack Levels

Bushfire Attack Level	Heat Flux Thresholds (kW/m^2)	Predicted Bushfire Attack and Levels of Exposure	Construction Section – AS3959:2018
BAL – LOW	See Clause 2.2.3.2 of AS3959:2018 – Low threat vegetation and non-vegetated areas	There is insufficient risk to warrant specific construction requirements.	4
BAL-10	≤10 kW/m^2	Ember attack, burning debris ignited by windborne embers and radiant heat up to a level of 10 kW/m^2.	Refer to section 9.4 of the 'Bushfire resilient communities' document
BAL-12.5	≤12.5 kW/m^2	Significant ember attack, burning debris ignited by windborne embers and radiant heat up to a level of 12.5 kW/m^2.	3 and 5
BAL-19	>12.5 – ≤19 kW/m^2	Greater levels of ember attack, burning debris and radiant heat up to a level of 19 kW/ m^2.	3 and 6
BAL-29	>19 - ≤29 kW/m^2	Greater levels of ember attack, burning debris ignited by windborne embers and radiant heat up to a level of 29 kW/m^2.	3 and 7

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Bushfire Attack Level	Heat Flux Thresholds (kW/m^2)	Predicted Bushfire Attack and Levels of Exposure	Construction Section – AS3959:2018
BAL-40	>29 - ≤40 kW/m^2	Greater levels of ember attack, burning debris ignited by windborne embers and radiant heat up to a level of 40 kW/ m^2. Flames from the bushfire front may intermittently contact the house.	3 and 8
Flame Zone – BAL-FZ	≥ 40 kW/m^2	The highest level of bushfire attack as a consequence of direct exposure to flames from the fire front, in addition to heat flux and ember attacked. Greater levels of ember attack, burning debris and radiant heat in excess of 40 kW/m^2. Flames from the bushfire front are likely to engulf part or all of the building.	3 and 9

The BRC Technical Guide requires that radiant heat exposure/ BALs are calculated using either the SPP Bushfire APZ calculator (QFES, 2019b), which is the preferred method, or Method 2 of AS3959:2018. Where Method 2 is used, the following inputs are to be used:

- site-specific values for FFDI (Step 1)
- ground-truthed VHCs (Step 2) and their associated fuel loads (provided in Figure 14 of the BRC Technical Guide); and
- site and effective slopes (Step 3).

The Flamesol Method 2 Minimum Distance calculator has been used to calculate the minimum separation distance required between the development and bushfire-prone vegetation for each BAL. These results are provided in **Appendix 2** and

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Figure 9 and summarised in **Table 7**.

Table 7: Determination of Bushfire Attack Level Minimum Separation Distances for Bushfire-prone Vegetation

Bushfire Attack Level →	VHC	BAL-FZ	BAL-40	BAL-29	BAL-19	BAL-12.5	BAL-10
North, west, south & east	40.4	0-<8.2m	8.2-<11.2m	11.2-<16.6m	16.6-<24.2m	24.2-<29.1m	**29.1-100m**

PO1 of the Townsville City Plan 2014 - Bushfire Hazard Overlay Code requires that the premises maintains the safety of people and property from the adverse impacts of bushfire. The premises will materially increase the number of people congregating on the premises for operational purposes. Given that the site-specific remodelled mapping of bushfire-prone areas shows that the majority of the lot is outside the 'Medium' hazard, 'Potential Impact Buffer' area, which has minimised the bushfire prone area potential. A detailed bushfire emergency management and evacuation plan shall be prepared to ensure the safety of people is maintained.

The current layout plan proposes to site permanent built structures along the Bidwilli road, concentrated from the western boundary. In their current location, these structures are potentially subject to a radiant heat exposure of BAL – Flame Zone (BAL-FZ). PO3 requires that development design and siting of buildings is away from hazardous vegetation to achieve an 'acceptable risk' or 'tolerable risk'. The code does not specify a maximum radiant heat/BAL for development nor any other specific and measurable outcomes to achieve an acceptable risk. The BRC Technical Guide provides the following definitions in relation to risk (QFES, 2019):

- 'Acceptable risk' – a level that is sufficiently low to require no new treatments or actions, thereby allowing communities to live with the risk without further action; and
- 'Tolerable risk' – low enough to allow the exposure to a natural hazard to continue but high enough to require new treatments or actions to reduce that risk. The community can live with this level of risk, but as much as reasonably practical be done to reduce the risk. This may include planning responses for reducing the likelihood of the risk (avoidance) or reducing the consequences of the risk (i.e., mitigation and hazard management over time).

Given that the premises is situated within a grassfire-prone zone, establishing an Asset Protection Zone greater than 29.1 meters will result in an 'acceptable risk'. This measure aligns with PO3 of the Townsville City Plan.

The Townsville City Plan 2014 Bushfire Hazard Overlay Code does not define a maximum acceptable radiant heat flux/BAL for a BESS. However, BESS projects are required to have a maximum radiant heat flux of 10 kW/m² (BAL-10) in line with recommendations found in the SPP Guidance Material for Natural Hazards, Risk and Resilience – Bushfire State Interest (DSDMIP, 2019). The separation distances necessary to achieve a maximum radiant heat flux of BAL-10 are indicated in **Table 7**.

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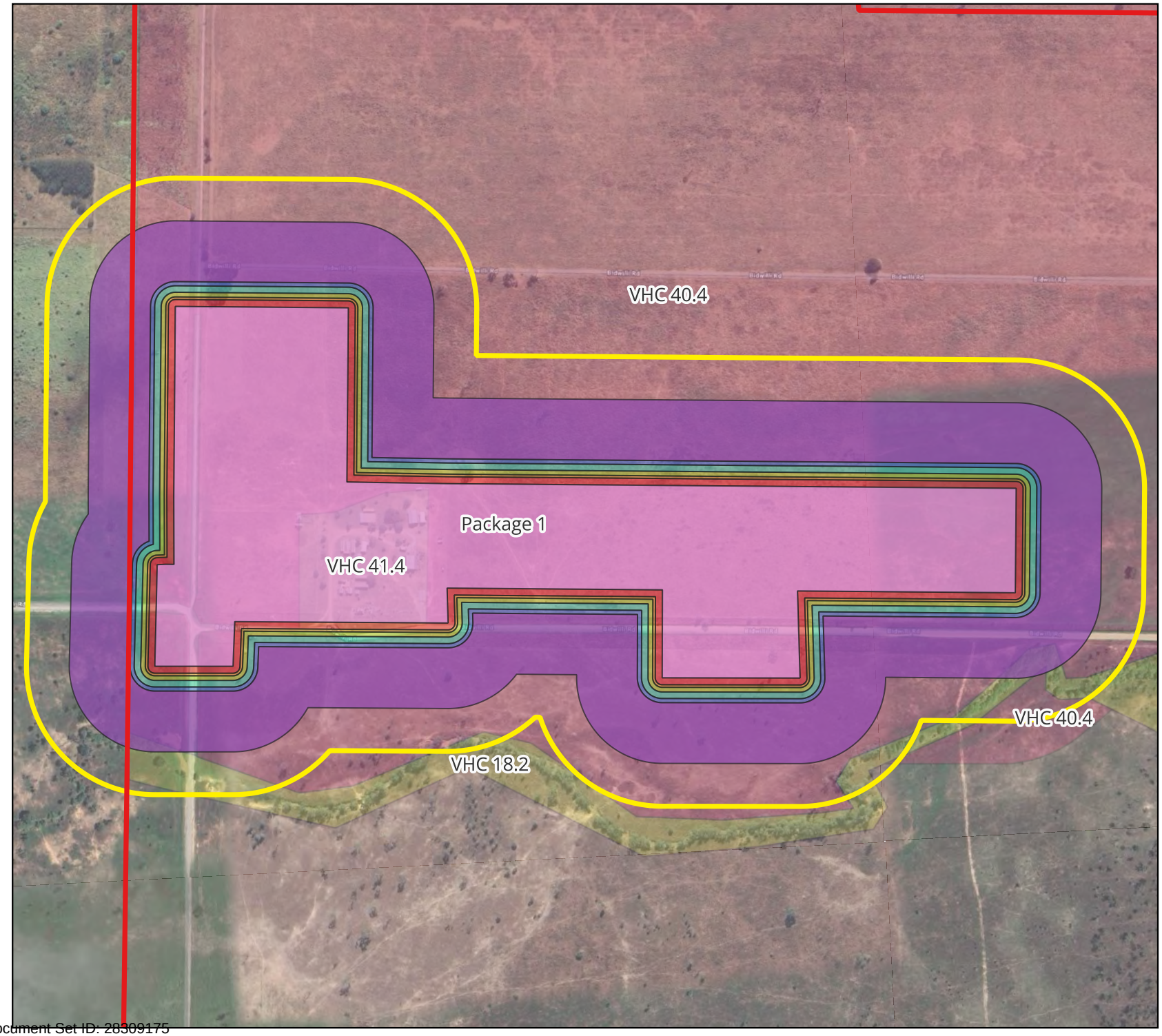

Figure 9: Bushfire Attack Levels

Project: PR25087 - Northern Quartz Campus and Transmission Line

150m assessment area

BALS - Hazardous Vegetation VHC 40.4

- Flame Zone
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- BAL-10

Notes:
- Survey Data by Green Tape Solutions
- Site Infrastructure and Impact Areas from Client
- Base map Copyright (c) Google and its data suppliers.

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0 50 100 m

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4 Bushfire Management Plan

The SPP requires that where it is not possible to avoid a BPA, development mitigates bushfire risk to people and property to an acceptable or tolerable level. This can be achieved through development design and siting, hazard reduction measures, building construction to improve the ability of buildings to better withstand bushfire attack and emergency management and evacuation measures. These practices and measures include fuel reduction and management (for example, vegetation clearing and ongoing vegetation management to maintain areas in a low fuel state), road infrastructure to provide safe access and egress, appropriate building design and construction standards, procedures for fighting bushfires, and fire intensity reduction management measures.

4.1 Agencies / Persons Responsible

The responsible fire authority is the Rural Fire Service Queensland (RFSQ). The project area is located closest to Townsville Fire and Rescue Service. It is recommended that consultation be undertaken with QFD, the local RFSQ brigade and any other relevant land manager (e.g., the department within Townsville council responsible for bushland reserve management).

It is the responsibility of the proponent to ensure that the relevant measures required by this plan are in place prior to inspection by the building certifier, and to ensure that measures are in place prior to enacting the approval, and for the duration of the specified use of the premises. Furthermore, it is the responsibility of the proponent to ensure that a copy of this report is always on hand at the site.

Attempts have been made to contact and obtain advice from the QFD specific to the design of this project; however a response has not been received. The advice provided by the QFD noted in **Section 4** has been extrapolated from other similar BESS projects recently undertaken by Green Tape Solutions and requirements specified by the Townsville City Plan 2014 (version 2024/01) Bushfire PSP and PSP policy 6.4.

4.2 Owner / Occupier Responsibilities

It is the responsibility of the relevant lot manager to maintain the premises in accordance with the conditions outlined in this report. The owner / occupier responsibilities include:

- An APZ is to be established and maintained between permanent built structures and bushfire-prone vegetation. The APZ is to be managed in accordance with the measures outlined in **Section 4.6**;
- All access routes are to remain clear of obstacles to enable effective emergency vehicle access and egress;
- No burning is to be undertaken within the premises without a Permit to Burn as issued by the local Fire Warden (and approval if required, in writing, from Council); and
- The storage or handling of hazardous chemicals on the premises must not result in an unacceptable risk to people, property and the environment. Hazardous chemicals should not present a risk to or impose upon emergency services when responding to an emergency or evacuation.

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4.3 Reporting and Auditing

This report is a controlled working document that is to be updated and revised to reflect adaptive management and constructive feedback. Some sections of the plan may be modified, new procedures may be implemented, and responsibilities altered, depending on feedback and application.

This report will only ever be modified in consultation with Townsville City Council and upon the agreement of all relevant stakeholders. This agreement allows for changes to the plan scope, as determined through consultation and the acceptance of the proponent. That is, where further actions are deemed necessary or where actions can be reduced in scope.

4.4 Siting of Buildings

In accordance with the SPP 2017 (and associated SPP guidance material) and the Townsville City Plan 2014 (version 2024/01) the proposed design has considered the following key principles when siting development:

- Utilising land that is predominantly cleared to minimise ecological impacts to native vegetation;
- Maximising where practicable building frontage setbacks from any hazardous vegetation; and
- Siting of buildings so that elements of the development that are least susceptible to fire are situated closest to the bushfire hazard (e.g., driveways, parking areas, and protective landscape treatments).
- A minimum separation distance of 3.5m between battery energy units 20m from the nearest hazardous vegetation to reduce contact with potential fire hazards and reduce the likelihood of multiple units reaching thermal runaway (failure).

4.5 BESS Design and Fire Hazard Measures

The design incorporates the construction of a large BESS of approximately 11.7 hectares with the manufacturer CATL, and the UL9540A certification recommending a minimum separation distance of 3.5m between units.

The design of the BESS units incorporates several design features to minimise fire risks including mechanical design, thermal management system, battery management system, electrical fault protection, deflagration and explosion control system.

Initial tests of the BESS units have determined the following conditions:

- A normal operation temperature of 50°C with superficial area temperature approximately 58°C-60°C
- Initial stages of thermal runaway (failure) occurring when temperatures reach approximately 1350°C

Fire and exposure protection measures recommend fire suppression or the unit being designed to burn out. In the unlikely event of a BESS container catch fire, the proposed measure is to allow the

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unit to burn out and does not include aerosol or dry pipe for fire suppression.

4.6 Asset Protection Zones

The use of an APZ is the most effective defence against flame and radiant heat and to a lesser extent, ember attack. The APZ incorporates defendable space and allows for managing heat intensities at the building surface. Appropriate vegetation management measures shall be required to manage fine fuels, which have the greatest influence on the spread of a conventional flame front-driven bushfire (Queensland Government and CSIRO, 2020).

An APZ of 29m has been established around the entire proposed premises (**Figure 10**) and will be managed with the following requirements:

- the APZ is to be maintained as an area free of flammable material to provide defendable space and for managing heat intensities at the building surface;
- all buildings and structures except fencing, swimming pools or metal/concrete water tanks are to be excluded from the APZ;
- any fencing is to be constructed from non-combustible materials;
- flammable objects must not be located within 6 m of any building or combustible structure;
- all trees are to have lower limbs removed up to a height of 2 m above the ground;
- trees and shrubs must not overhang or touch any elements of buildings;
- canopy trees identified for retention can be retained over a managed understory;
- landscaping treatments within the APZ shall comprise only low threat vegetation, including lawn areas managed in a minimal fuel condition (i.e. ≤ 100 mm nominal height as specified in AS3959:2018) and species that are of low combustibility (i.e., species with high leaf moisture content, low volatile oil content, absence of shedding bark, low production of leaf litter etc.);
- plants should be arranged to minimise vertical and horizonal connectivity of plant material;
- shrubs must not be located under the canopy of trees or within 3 m of a building or structure;
- plants greater than 100 mm in height must not be placed within 3 m of a window or glass feature of the building;
- individual and clumps of shrubs must not exceed 5 m^2 in area and must be separated by at least 5 m;
- mulches within any landscaped areas are to be non-combustible; and

Regular maintenance of the APZ should be undertaken to remove fuels and debris, particularly prior to and during the fire season (i.e., late Winter to early Summer). This must include regular vegetation management and maintenance where necessary and practicable (e.g., grass slashing, weed removal, etc.) and removal of debris and rubbish.

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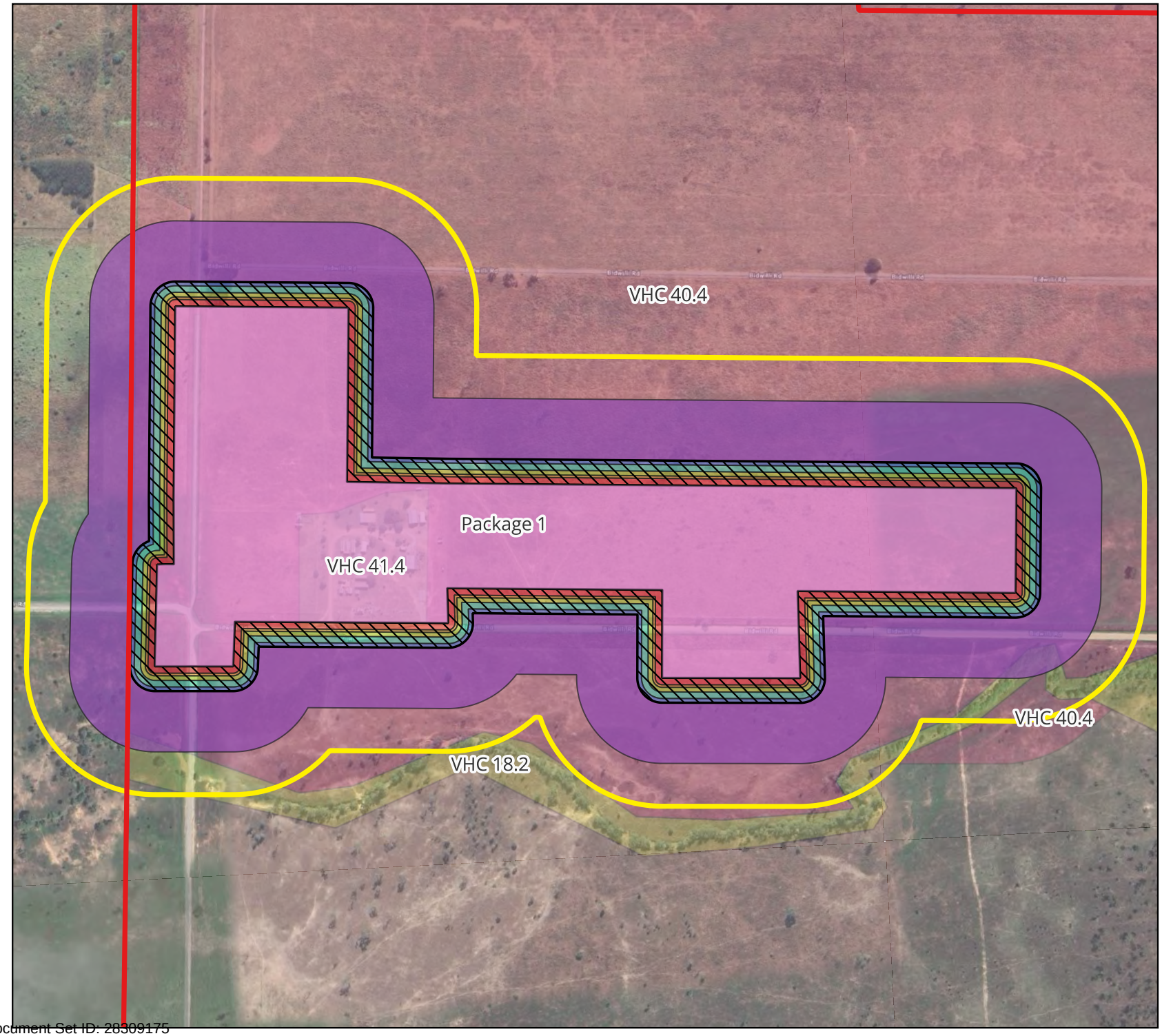

Figure 10: Asset Protection Zone

Project: PR25087 - Northern Quartz Campus and Transmission Line

150m assessment area

APZ - 29.1m

BALS - Hazardous Vegetation VHC 40.4

- Flame Zone
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- BAL-10

Notes:
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0 50 100 m

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4.7 Access Roads

Primary access and egress shall be provided via the main entry point/access driveway off Bidwilli Road in the middle of the site from the eastern boundary. The existing dirt road cuts through the project to the west (approximately 1.4km long) and connects to an unnamed track that joins with Manton Quarry Road to the south. However, access through this track is restricted via a gate approximately 800m from Manton Quarry Road.

The main access through Bidwilli road is approximately 5m wide with flat. The road is unsealed with two meters of maintained grass on either side for a total of 7m. The width of this road complies with the QFD vehicle access requirements, additionally it is proposed that the road is sealed in the future with bitumen. A sufficient turning point for emergency services will also be required along this road to meet the requirements of the QFD vehicle access requirements.

An unnamed track along the western boundary that connects Bidwilli road to Ghost Gum Road is unsealed and not maintained with a width of approximately 3m. It is recommended that this track is widened and upgraded in the future to meet and maintain QFD vehicle access requirements and any other relevant requirements, including requirements under the Works Codes and PSP6 Engineering Design Standards.

Access to the northern boundary of the site along Ghost Gum Road from the Flinders highway is currently restricted. A creek also intersects the track that will periodically flow under high rainfall conditions. It is recommended that the access point is reinstated to provide an additional egress and access point in the event of an emergency, as well as installing a safe crossing point to avoid obstructing emergency services or evacuation routes.

The proposed design shall also provide safe and efficient access for emergency services via multiple entry and exit points, and safe and efficient egress for occupants of the premises away from the most likely direction of an approaching bushfire. Roads shall have a cleared minimum width of 6 m which will be always maintained via vegetation management (e.g., through branch trimming, removal of unstable trees or weed and vegetation slashing and management). Roads shall also be maintained to ensure safe and unobstructed access for emergency services and egress for occupants of the premises.

4.8 Electricity Supply

The proposed development will have access to mains electricity supply. Where practicable, electrical transmission lines will be installed underground.

4.9 Water Supply

The premises does not have access to a reticulated water supply. The Townsville City Plan 2014 - Mitigating Bushfire Hazard Planning Scheme Policy (Bushfire PSP) refers to the On-site Water supply policy (SC 6.4.11.7) of the Development Manual PSP (SC 6.4) for specific requirements for fire-fighting supply (SC 6.4.11.7 (11)). A minimum of 20,000L of stored water is required for a property greater than 2500m2 and must always be available and accessible. Other specifications for firefighting supply include:

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- At least one tank within 100m of the building that contains fire brigade tank fittings, or a 200mm (minimum) access hole to allow for suction if the tank is underground
- Clear signage must be displayed for emergency services to identify the location of water supplies, including signage that water within the tank is not suitable for consumption
- Firefighting water supplies (including pipelines, hydrants, fittings, and storages) are:
    - To be provided before building construction commences;
    - designed, located, and fitted to ensure reliability during a fire (e.g., polyethylene pipes are buried or shielded ¬ refer to the National Plumbing and Drainage Code AS 3500);
    - properly maintained and accessible at all times by emergency vehicles;
    - tanks must be located so that a vertical clearance of 4 m to overhanging obstructions is achieved (vegetation, power lines);
    - a cleared area on either side of the tanks, a minimum of 6 m, to allow firefighting vehicles and crews access to the tanks; and
    - tanks should avoid be located on slopes, including access to, greater than 12 per cent.

As the BESS is of a significant size and does not conform to the typical structure or dwelling definitions in the Townsville City Plan, and given that the premises area approximately 194,850m^2, a minimum of three 50,000L tanks is required and a feasible option to adequately supply emergency services for the purpose of cooling BESS containers in response to a “runaway” fire incident.

4.10 Climate Change and Fire Weather – Projections for 2050

Climate change can act in two ways to affect fire behaviour. First, it is likely to exacerbate the fire-weather risk on any given day, leading to increased frequency or intensity of extreme and very extreme fire-weather days particularly within the fire season. Secondly, an increase in the accumulated fire risk over a year might represent a longer fire season and a reduction in the number of days suitable for prescribed burning.

It is recommended to review this document and associated bushfire procedures for the premises over the coming decades in response to any potential increases of bushfire risk from climate change.

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5 Emergency Preparedness and Response

5.1 Response

If a fire starts on-site, residents or occupants trained to extinguish fires can attempt to do so with a fire extinguisher or fire blanket if they assess that it is safe to do so at the time. If the fire cannot be safely extinguished with a fire extinguisher, the following RFSQ procedure will be followed.

1. Assess the fire situation.
2. If there is any doubt regarding whether there is a fire situation, the RFSQ should still be called.
3. Ensure the safe evacuation of all occupants from the whole of the premises.
4. Account for all occupants at the assembly area.
5. Ensure occupants do not attempt to re-enter the whole of the property until it is safe to do so.
6. Meet the QFD and advise them of any information relevant to the situation.

If a fire occurs adjacent to the premises, residents and occupants will assess the fire situation in consultation with adjacent landholders and contact the RFSQ and other relevant authorities to report the fire. Personnel shall continue to assess and monitor the fire situation. If the fire has the potential to move into the premises and impact upon infrastructure or human and environmental values, emergency response procedures should be implemented and liaison with the relevant adjacent landholder/s, RFSQ, and other relevant authorities should occur where necessary.

If a fire occurs on site and personnel need to be evacuated, assembly points and evacuation routes across the site will be established and displayed on the site buildings within the premises. Specific emergency egress routes according to the proposed access roads and easements have been outlined in **Section 4.7**.

5.2 Emergency Response Procedures

An on-site bushfire management and evacuation strategy should be developed and available to implement in the event of an emergency. In the event of a pending fire emergency, assistance is to be obtained by contacting dialling 000 and evacuating all personal to a safe evacuation zone within the site.

It is also recommended that signs be erected throughout the premises that details the evacuation procedures, meeting points and egress routes. These will be used to identify to people the various egress routes available on site (including distances from each sign to the safety evacuation meeting point) in the event of an approaching bushfire.

Access to the premises will be provided via Bidwilli Road from the eastern boundary of the project area from the Flinders highway. This road shall provide safe and effective access and egress for emergency vehicles and occupants away from the direction of a bushfire most likely to approach from the north.

Table 8 illustrates local QFD resources.

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Table 8: Queensland Fire Department Local Resources

Queensland Fire Department	
Region: Northern Region	
Northern Region Headquarters	12 Morey St South Townsville 4810 Ph: (07) 4796 7480
Zone: Southern Command Zone	
Giru Fire Station (Auxiliary station)	12 Brookes Street Giru 4809 Ph: 07 4796 7404
Townsville Fire Station (Permanent station)	12 Morey Street South Townsville 4810 Phone: 07 4796 7480
Wulguru Fire Station (Permanent station)	171 Stuart Drive Wulguru 4811 Ph: 07 4778 4313
Rural Fire Service Brigades	
Oak Valley Rural Fire Brigade	15 Chisholm Trail, Oak Valley QLD 4811 Ph: 0747969082

5.3 Emergency Resources and Information Providers

5.3.1 Local Radio Stations:

- Triple M Townsville 102.3 FM – Triple M Townsville 102.3 – Triple M
- Hit Townsville 103.1 FM - hit103.1 Townsville - Hit Network
- Triple t 103.9 FM – Radio station | Triple T 103.9 FM | Townsville
- ABC North QLD 630AM - ABC North Queensland

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5.3.2 Townsville City Council – Emergency Dashboard

The TCC operates an Emergency Dashboard. The platform provides information in regard to emergency news, road conditions, weather warnings and power outages.

The Emergency Dashboard is accessible on the website (https://disaster.townsville.qld.gov.au/).

It is also recommended that residents and other frequent visitors are signed up to the "Opt-In Notifications" to receive SMS messages from TCC regarding information on arising local disasters, severe weather and emergency events within the Townsville region.

5.3.3 State Government, QFD – Current Warnings

The QFD publishes the current warnings and incidents across Queensland. This is available on the website (https://www.fire.qld.gov.au/Current-Incidents).

In the event of a bushfire emergency, do not rely on a single source of information, check multiple places to stay up to date.

5.3.4 Australian Fire Danger Rating System (AFDRS) and Fire Bans

Following recommendations from the 2020 Royal Commission into National Natural Disaster Arrangements, the Australian Fire Danger Rating System (AFDRS) was introduced nationwide as a transformative tool to improve risk communication and support evidence-based fire management across Australia.

The AFDRS incorporates advanced fire behaviour models and updated data to produce four (4) distinct fire danger ratings, covering a broad range of Australian landscapes (**Figure 11**). AFDRS signs are now posted in key locations across Queensland and Australia to help communities understand fire risks more effectively.

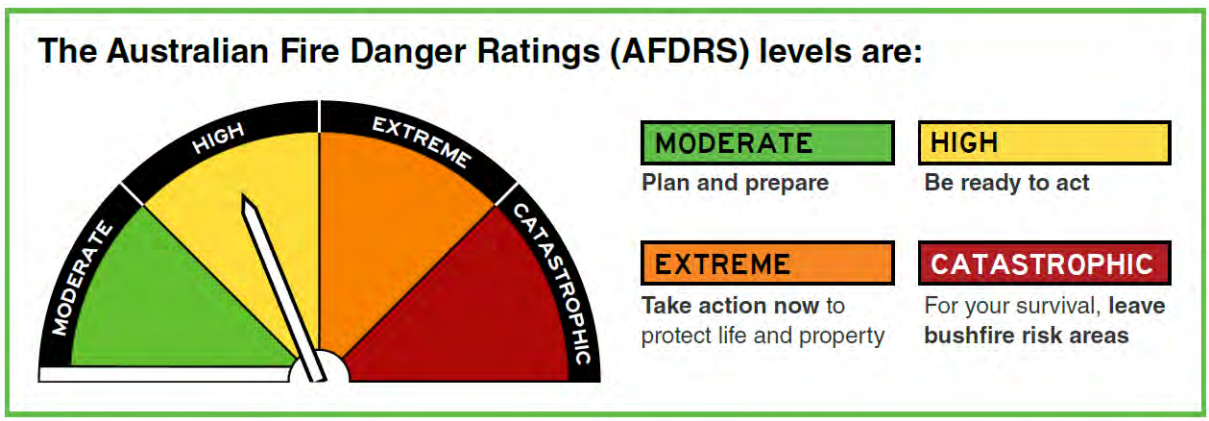

Figure 11: Australian Fire Danger Rating System

The AFDRS uses data from the Australian Bureau of Meteorology (BoM) to establish fire danger ratings for different regions across Australia. The Fire Behaviour Index (FBI), based on McArthur's (1967) research, is a scale of potential fire behaviour ranging from 0 to over 100. The FBI informs QFD operational decisions, such as the enforcement of total fire bans within the region.

Table 9 presents the conversion of FBI values to AFDRS ratings. Current fire danger ratings are accessible at https://www.fire.qld.gov.au/prepare/bushfire/fire-danger-ratings.

Table 9: Fire Behaviour Index Values for Australian Fire Danger Rating System

Fire Behaviour Index	Australian Fire Danger Rating System
0 to 11	No rating
12 to 23	Moderate
24 to 49	High
50 to 99	Extreme
100 +	Catastrophic

This plan requires that activities like mowing, slashing, grinding, or any other mechanical operations that could generate significant heat or sparks within bushfire-prone or densely vegetated areas of the Project Area be prohibited on any day with an Extreme fire danger rating (FBI of 50 or above).

Fire Ban Areas may be declared locally, regionally, or statewide based on predicted weather conditions informed by the FBI. These bans are imposed under the *Fire and Emergency Services Act 1990* when conditions indicate that fires could become difficult to control and pose a high risk to communities and life. On total fire ban days, any activities that could increase the risk of ignition should be minimized as a precautionary measure.

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6 Assessment Against the Bushfire Hazard Overlay Code

The project area is mapped with the Townsville City Plan 2014 (version 2024/01) Bushfire Hazard Overlay, which triggers a response to the Bushfire Hazard Overlay Code. An assessment against this code is provided in **Table 10**.

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Table 10: Assessment against the Townsville City Plan 2014 (version 2024/01) Bushfire Hazard Overlay Code

Performance outcomes	Acceptable outcomes	Compliance Assessment
General — all development **Editor's note —** Applicants should also refer to the Mitigating bushfire hazard planning scheme policy no. SC6.8 for additional information.		
PO1 Development maintains the safety of people and property.	No acceptable outcome is nominated.	**Complies with PO1** The proposed development does not involve the accommodation or congregation of vulnerable sectors of the community.
PO2 Highly vulnerable development does not occur in high hazard areas unless there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.	**AO2** The following uses are not located in a high bushfire hazard area: 1. child care centre; or 2. detention facility; or 3. educational establishment; or 4. emergency services; or 5. hospital; or 6. industry activities involving manufacture or storage of hazardous materials in bulk; or 7. multiple dwelling; or	**Complies with PO2** The project is not located in a high bushfire hazard area, and the development is classed as industrial use.

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	8. residential care facility; or 9. retirement facility; or 10. relocatable home park; or 11. rooming accommodation; or 12. shopping centre; or 13. short-term accommodation; or 14. telecommunications facility; or 15. tourist park; or 16. tourist attraction; or 17. transport depot; or 18. utility installation.	
PO3 Development mitigates the risk of bushfire hazard through the siting and design of the development. **Editor's note—**In demonstrating compliance with this performance outcome, applicants should be aware that setbacks and buffers for fire management purposes are in addition to any buffers or setbacks required for ecological purposes and are located outside of areas of ecological significance to the greatest extent possible.	No acceptable outcome is nominated.	**Complies with PO3** The development design and siting of buildings is away from any mapped bushfire hazard areas or areas of ecological significance. Section 3.2 outlines the approach to achieve an 'acceptable risk'.
PO4 Development provides for an adequate	**AO4.1.1** The development is connected to a reticulated	**Complies with PO4** The development design will incorporate a

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and accessible water supply for firefighting purposes.	water supply where within a water supply area. OR **AO4.1.2** Where outside a water supply area a tank water supply is provided, at least one tank is within 100m of a class 1, 2, 3 or 4 building which has fire brigade fittings. **Editor's note -** Applicant should also refer to the Development manual planning scheme policy SC6.4 - SC6.4.11.7 On-Site Water Supply for additional information.	minimum of three 50,000 litre tanks for onsite water storage, exceeding the specifications outlined in Section 4. This approach ensures compliance with recommendations from QFD as well as the relevant requirements of the Townsville City Plan 2014 Development Manual PSP (section SC 6.4.11.7(11)) relating to onsite water supply.
PO5 Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on hazardous materials manufactured or stored in bulk.	**AO5** Development does not involve the manufacture or storage of hazardous materials within a high or medium bushfire hazard area as identified on overlay map OM-02.	**Complies with AO5** Any manufacturing of storage of hazardous material associate with the Green Poly BESS is located outside of medium bushfire hazards mapped within or near the project.
PO6 Facilities with a role in emergency management and vulnerable community services are able to function effectively during and immediately after bushfire events.	No acceptable outcome is nominated.	**Complies with PO6** The design of the site incorporates safe access and egress points via Bidwilli Road and Manson Quarry Road, as well as sufficient resources for emergency management. It has been recommended that the access between Ghost Gum Road and the Flinders Highway be reopened and upgraded to provide an additional egress point.

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PO7 Additional lots are not created in bushfire hazard areas.	**AO7** Development does not involve the creation of additional lots in areas mapped as high or medium hazard on overlay map OM-02.	**Complies with PO7** Additional lots will not be created within mapped bushfire hazard areas.
PO8 Development is designed to allow for efficient emergency access to buildings for firefighting appliances, including by avoiding long, narrow access arrangements.	No acceptable outcome is nominated.	**Complies with PO8** The design of the site including access roads, water supply and siting of buildings provide safe access for emergency services in accordance with Australian Standards and regulations for bushfire management.
PO9 Development provides a fire break which also facilitates adequate access for firefighting and emergency vehicles, and safe evacuation.	**AO9.1** Lot boundaries and development sites are separated from hazardous vegetation by a distance of 20m where adjacent to high hazard areas and 10m where adjacent to medium hazard.	**Complies with PO9** The design is located more than 20m away from hazardous vegetation and contains roads that are already 6m in width. The location of the site is flat and contains a road that passes through the entire site from the eastern to the western boundary which allows for multiple safe access and egress points for emergency services and personnel in the event of an emergency.
	AO9.2 The separation area mentioned in AO9.1 contains a fire access trail that: 1. has a minimum cleared and formed width of 6m; 2. has vehicular access at each end; 3. provides passing bays and turning areas for fire-fighting appliances; and	

	4. are either located on public land, or within an access easement that is granted in favour of council and QFRS.	
	AO9.3 Roads and trails: 1. have a maximum gradient of 12.5%; and 2. do not involve a cul-de-sac. **Editor's note—**Applicants should also be aware that Part 9 of the planning scheme sets out additional requirements for the construction of roads and other operational works associated with reconfiguration.	

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7 Conclusion

This assessment for the proposed Green Poly Project – Package 1 (Green Poly BESS and Switchyard) confirms that while the adjacent vegetation is classified as grassfire prone and not bushfire prone, there remains a risk of fast-moving grassfires that could affect the premises. Vegetation of concern lies to the north, west, east, and southwest of the premises, with a continuous patch of dense, open grassland forming a potential fire path. Although these conditions do not trigger the calculation of radiant heat flux or Bushfire Attack Level (BAL) requirements typically reserved for bushfire-prone sites, the findings indicate a residual exposure risk that warrants mitigation.

In line with PO3 of the Townsville City Plan 2014 – Bushfire Hazard Code, the siting and design of structures must maintain an 'acceptable' or 'tolerable' level of risk. As such, to minimise potential radiant heat exposure—which could reach BAL–Flame Zone (BAL-FZ) at the site perimeter—a maximum radiant heat flux of 10 kW/m² (BAL-10) is recommended, consistent with the State Planning Policy Guidance (DSDMIP, 2019). To achieve this, a 29.1-metre Asset Protection Zone (APZ) has been proposed along the entire boundary of Package 1. Maintenance of this APZ, will require regular removal of vegetation and fuel loads. Most of the APZ area is already cleared and has minimal ecological impact due to dominance by weeds.

Access and egress during emergencies are facilitated by the primary driveway from Bidwilli Road (to be upgraded to bitumen), with additional potential escape routes along Ghost Gun Road and a southern unnamed track to Manton Quarry Road. These will require improvements, such as clearing and widening, particularly to accommodate fire-fighting vehicles.

The bushfire assessment has been carried out in accordance with the BRC Technical Guide and utilises QFD data and the VHC classification system. This project complies with the State Planning Policy benchmarks for natural hazards and the current Townsville City Plan 2014 – Bushfire Hazard Overlay Code, provided that recommended APZ management and access upgrades are implemented. These measures collectively reduce bushfire risk to acceptable levels and support the safe development of the Green Poly Project – Package 1.

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Appendix 1

Proposed Development Layout

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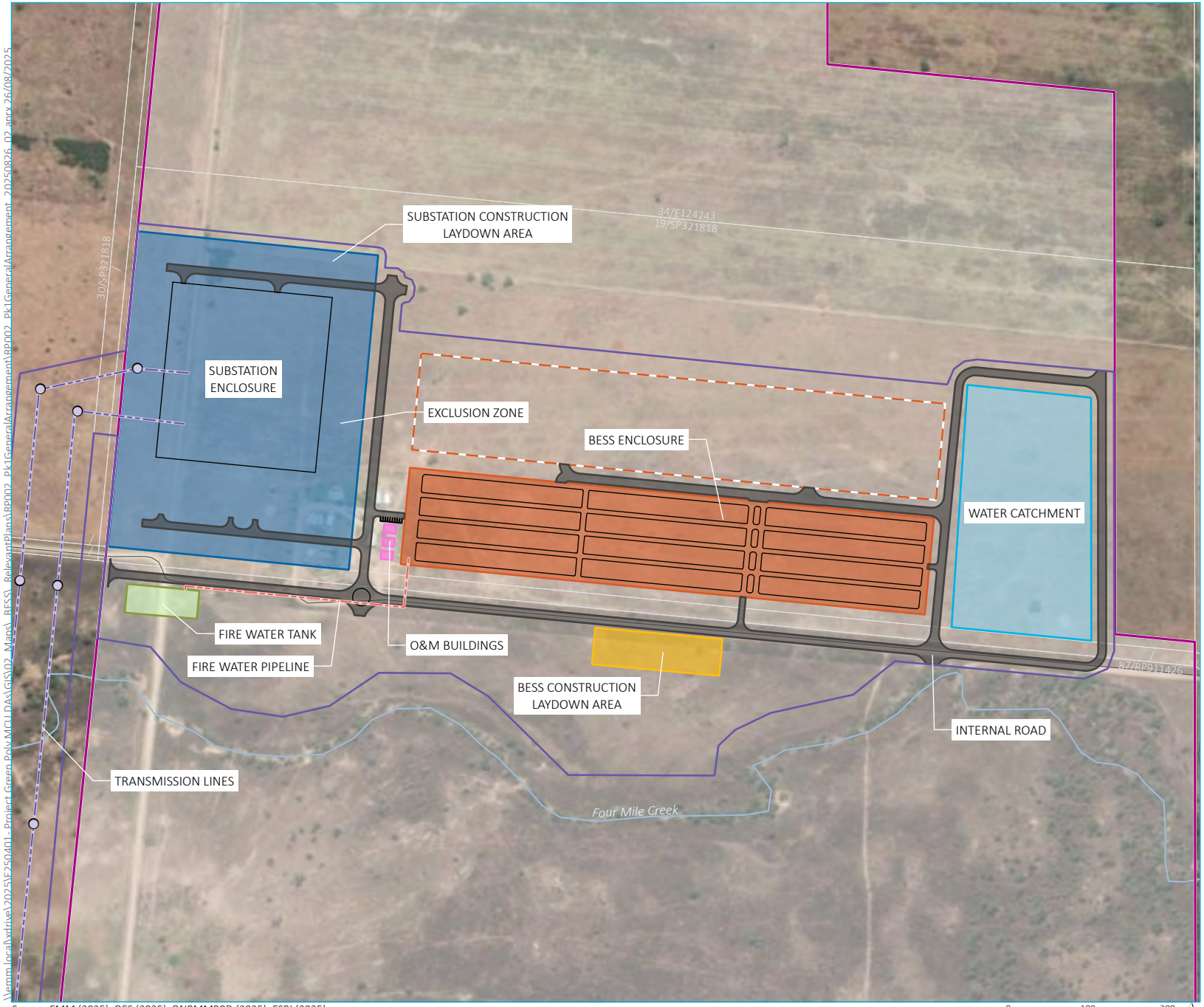

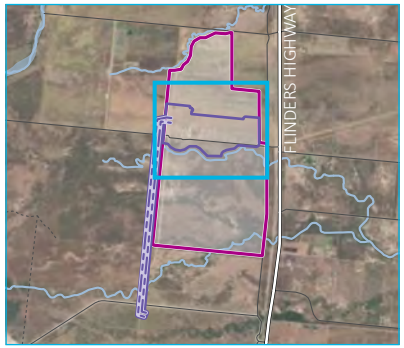

KEY

- Northern Quartz Campus
- Package 1- Premises

Package 1 proposed site layout

- BESS
- BESS expansion area
- Substation
- O&M building
- Construction laydown area
- Water management area
- Fire water pad
- Internal road
- Fire water pipeline
- Transmission line
- Transmission pole

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- Cadastral boundary

Source: EMM (2025); DES (2025); DNRMMRRD (2025); ESRI (2025)

0 100 200 m

GDA2020 MGA Zone 55

N

Site infrastructure
General arrangement

Northern Quartz Campus
Package 1
BESS, transmission line and substation
Planning Assessment Report- Relevant Plans
Figure 2

EMM creating opportunities

\\emm.local\xdrive\2025\F250401 - Project Green Poly\MCU\DAS\GIS\02_Maps_BESS_RelevantPlans\RP002_Pk1GeneralArrangement\RP002_Pk1GeneralArrangement_20250826_02.aprx 26/08/2025

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Appendix 2

Flamesol Method 2 Minimum Distance Calculations

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Calculated May 20, 2025, 3:59 pm (MDc v.4.9)

PR25087_Green Poly BESS_

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	64	Rate of spread	9.550000000000001 km/h
Vegetation Classification	Grassland	Flame length	6.75 m
Understorey fuel load	5.7 t/ha	Flame angle	66 °, 72 °, 78 °, 81 °, 82 ° & 86 °
Total fuel load	6.5 t/ha	Elevation of receiver	3.08 m, 3.21 m, 3.3 m, 3.33 m, 3.34 m & 3.36 m
Vegetation height	n/a	Fire intensity	32,075 kW/m
Effective slope	2 °	Transmissivity	0.881, 0.869, 0.85, 0.828, 0.8159999999999999 & 0.75
Site slope	0 °	Viewfactor	0.4061, 0.2976, 0.1995, 0.1345, 0.1093 & 0.0297
Flame width	100 m	Minimum distance to < 40 kW/m^2	8.199999999999999 m

Windspeed	n/a	Minimum distance to < 29 kW/m^2	11.2 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m^2	16.6 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m^2	24.2 m
		Minimum distance to < 10 kW/m^2	29.1 m

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005