

Appendix O Bushfire Management Plan

Bushfire Management Plan

'Lansdown Eco-Industrial Precinct'

Industrial Development: Utility Installation

WOODSTOCK, QLD 4816

Prepared for

Townsville City Council



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Prepared by	Scott Palin
Client Details:	Townsville City Council C/O Scott Mainey Senior Environmental Planner CDM Smith Australia By Email: maineysa@cdmsmith.com
Project Addresses	Woodstock, QLD 4816
Project Number	J3098
BlackAsh Contact Details	
Scott Palin	Bushfire Specialist
M: 0448 190 766	E: scott.palin@blackash.com.au

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Scott Palin | Bushfire Specialist

Blackash Bushfire Consulting

B.EnvScMan | Grad. Cert. in Bushfire Protection (UWS)

Fire Protection Association of Australia BPAD Level 2 BPAD-60359



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1. Summary

Table 1 is a summary of compliance with relevant documents and approaches to limit bushfire attack and meet the requirements of the Townsville City Planning Plan Version 2022/02 (TCP) framework for new development in Bushfire Prone Areas.

Table 1: Summary

TCP Classification	Material Change of Use - Utility Installation
NCC Classification	Pump Station – Class 10
Location	Woodstock, QLD 4816
Local Government Area	Townsville City Council
Can this proposal comply with AS3959:2018	Not applicable – Client Risk Assessment
Does this development comply with the purpose of SC6.8 Mitigating bushfire hazard planning scheme policy	Yes
Does this development comply with Section 8.2.2 Bushfire hazard overlay code	Yes
Assessment Benchmarks	<input checked="" type="checkbox"/> <i>Bushfire hazard overlay code</i> <input checked="" type="checkbox"/> Meets the deemed to satisfy provisions <input type="checkbox"/> Alternate solution/ performance-based assessment

2. Definitions

Definitions are provided as per AS3959:2018.

Asset Protection Zone. An area between an asset and a bushfire hazard where bushfire fuel has been reduced significantly to protect the asset.

Bushfire. An unplanned fire burning in forest scrub or grassland vegetation, also referred to as a wildfire.

Bushfire attack. Attack by burning debris, radiant heat or flame generated by a bushfire which might result in ignition and subsequent destruction of a building.

Bushfire Attack Level (BAL) 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. The following BALs, based on heat flux exposure thresholds are used in this report:

- (a) BAL—LOW
- (b) BAL—12.5
- (c) BAL—19
- (d) BAL—29
- (e) BAL—40
- (f) BAL—FZ

Bushfire hazard. A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control. Bushfire hazards are variable in their severity, with severity levels usually measured in terms of the fire intensity (kW/m²) arising from the hazard.

Bushfire prone area. An area that can support a bushfire or is likely to be subject to bushfire attack including forest, woodland, grassland and scrubland as well as nearby stands of vegetation. Bushfire prone areas do not include maintained lawns, parks or gardens, nature strips, plant nurseries, golf courses, vineyards, orchards or vegetation on land that is used for horticultural purposes.

Classified vegetation. Vegetation that has been classified in accordance with Clause 2.2.3 of AS3959

Fire Danger Index (FDI). The chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long- and short-term drought effects.

3. Introduction

Blackash Bushfire Consulting Pty Ltd (Blackash) has been engaged by CDM Smith Australia Pty Ltd (CDM) to prepare a Bushfire Management Plan (BMP) as part of the Lansdown Eco-Industrial Precinct – Enabling Infrastructure Project (LEIP). Blackash's scope includes the review of the overall study area, with specific assessment of two (2) elements of water infrastructure in an area located east of Woodstock township, approximately 38km south of the central business district of Townsville in North Queensland. The Project is currently being assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with the assessment process commencing in October 2022.

This assessment forms part of a larger risk assessment process currently being performed by the Townsville City Council, to review and plan for the Lansdown Eco-Industrial Precinct – Enabling Infrastructure Project.

The Lansdown Eco-Industrial Precinct – Enabling Infrastructure Project in summary will include:

- Provisions for new water infrastructure components;
- Upgrade of existing road infrastructure; and
- The establishment of a site laydown storage area.

The majority of the infrastructure (pipeline) is installed below ground, with only the above ground elements of infrastructure applicable to this bushfire assessment. The assessed above ground infrastructure will include:

- The Pump Station, which is located on the eastern side of the proposed new Raw Water Storage Dam; and
- The Laydown Storage Area – which will be utilised for the construction period only.

The project was referred under the EPBC Act and determined to be a controlled action – assessment by preliminary documentation. The request for information (RFI) associated with the decision has requested a BMP. With regard to the Queensland Planning Act 2016, Under Schedule 6, Part 3, Item 8 of the Planning Regulation 2017, operational work under a local categorising instrument is exempt if the work is undertaken by or for a public sector entity. As such, operational work approvals for the roads and water pipeline under a local categorising instrument (planning scheme, temporary local planning instrument or a variation approval) will not be required as Townsville City Council are considered a public sector entity.

Bushfire can present a number of risks and consequences to water infrastructure and personnel both in the construction and operational phases. The proposed infrastructure is impacted on by designated Bushfire Prone Areas and bushfire impact is a key consideration to ensure mitigation and risk is understood to reduce the consequences of any bushfire events.

With acknowledgment that the proposal is exempt from the Townsville City Plan (Version 2022/02) Section 8.2.2 Bushfire hazard overlay code, the key aspects of the code will still be considered as part of the overall assessment. The overlay codes provide assessment benchmarks for accepted development and requirements for assessable development to address a range of considerations including bushfire hazard. This report aims to demonstrate that bushfire has been considered in the design of the Project and that the proposed development complies with the Bushfire Hazard Overlay Code.

Given that the Project 's study area includes High Potential Bushfire Intensity Vegetation and Medium Potential Bushfire Intensity Vegetation (refer Figure 3), Blackash has provided the BMP to address the needs of the development proposal. The BMP aims to provide options to reduce the risk of Project works starting bushfires, and workers and infrastructure being impacted on by bushfire through a risk based approach. Where applicable, this will also include options for ongoing management of the vegetation around the assets to reduce the consequences of fire on the critical infrastructure.

Blackash's approach to the bushfire management is to identify and quantify the bushfire threat posed to the critical infrastructure and works corridor, so that the Townsville City Council can implement suitable mitigation measures to manage bushfire risk. Bushfire will be a key design consideration and the development represents a significant capital asset that must be protected from fire. Bushfire events are one of the constraints and considerations affecting the site.

This Bushfire Management Plan is in support of the LEIP, with appropriate consideration given to the intent and performance outcomes as provided in the Townsville City Plan Bushfire hazard overlay codes Assessment Benchmarks. This specialist bushfire assessment has been completed in accordance with the current version of the *Australian Standard for Construction of Buildings in Bushfire Prone Areas (AS3959:2018)*.

This BMP has been prepared with reference to the following documentation:

- o Townsville City Plan (Version 2022/02); and
- o AS3959:2018 Construction of buildings in bushfire-prone areas.

This assessment has been prepared by Mr. Scott Palin, Bushfire Specialist (Level 2 FPAA BPAD-A Certified Practitioner No. BPD-PA-60359) and reviewed by Mr. Lew Short, Principal at Blackash Bushfire Consulting (Level 3 FPAA BPAD-A Certified Practitioner No. BPD-PA-16373) who is recognised by the NSW Rural Fire Service (RFS) as qualified in bushfire risk assessment and has been accredited by the Fire Protection Association of Australia as a suitably qualified consultant to undertake alternative solution proposals.

This assessment is based on a desktop assessment of the study area, refer to Figures 1 and 2.

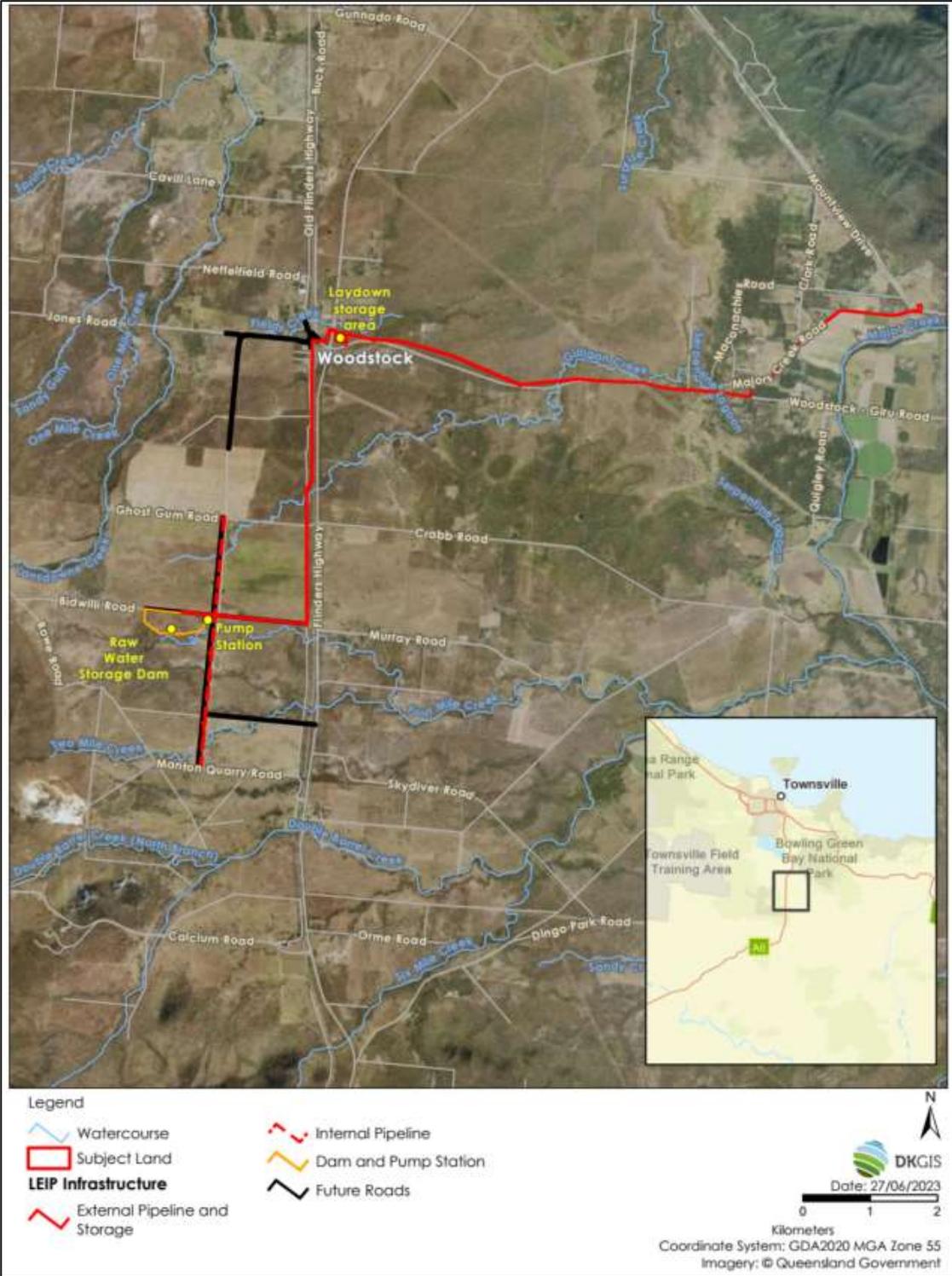


Figure 1: Site Location

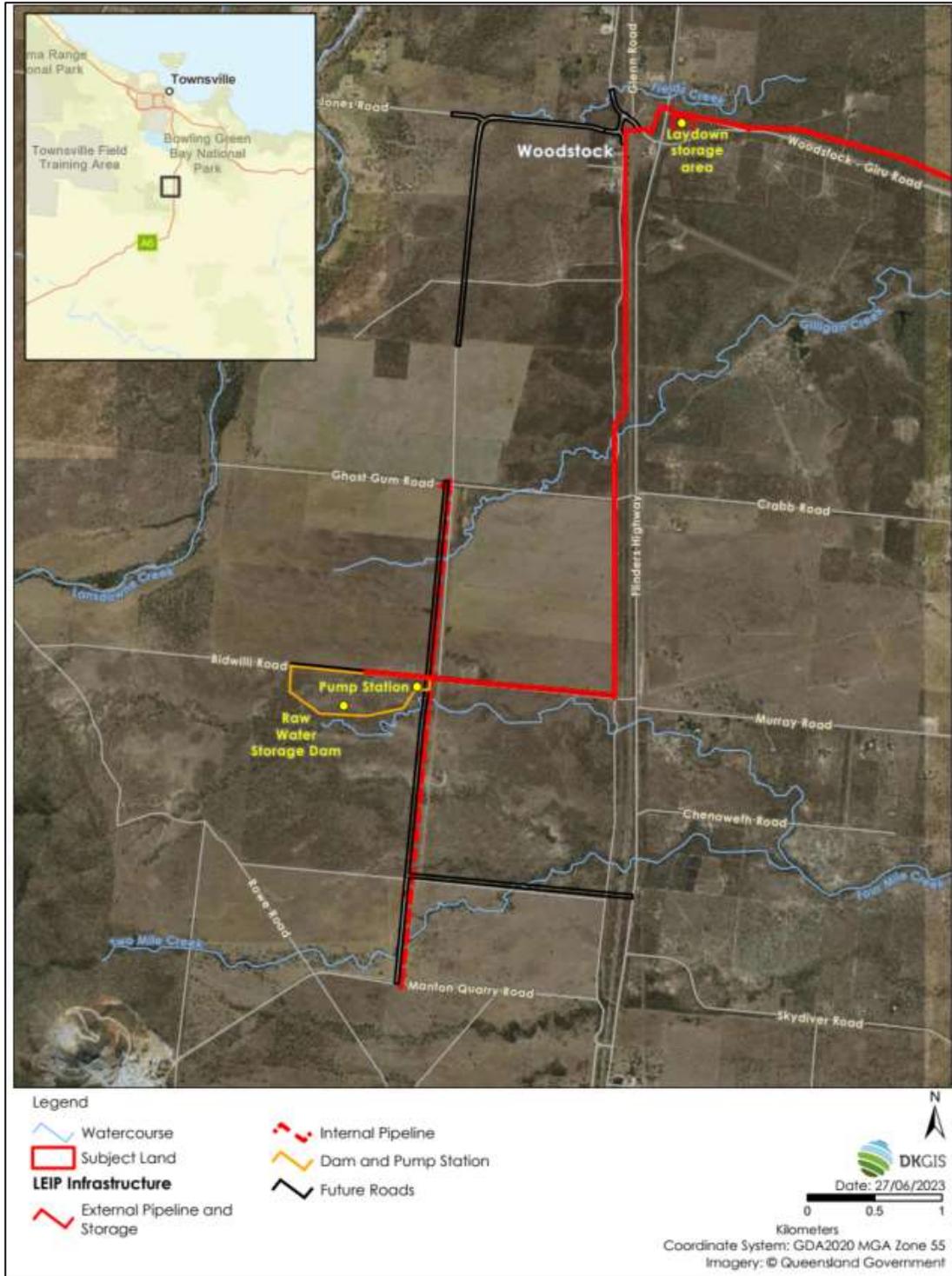


Figure 2: Infrastructure Locations

4. Bushfire Prone Areas

Parts of the study area are identified as being within 'bushfire prone Areas' (BFA), refer to Figures 3, 4 and 5, for the purposes of Chapter 2, Part 3 of the *Planning Act 2016* and the legislative requirements for development within BFA are applicable to the site.

BFA is land that has been identified by council, which can support a bushfire or is subject to bushfire attack. BFA maps are prepared by Council and included in Schedule 2.5 Overlay maps within the Townsville City Plan. Some areas are not designated as BFA, however, it is likely that most areas will support a bushfire due to the nature of fuels (grassland and grazing country). See Figure 6 and 7 for broad fire history of the area showing propensity for fire to impact areas not designated as BFA. The Development constraints overlay map OM-02 (Bushfire hazard) provides a trigger for the development assessment benchmarks and consideration of sites that are bushfire prone. All development on BFA must consider and comply with Section 8.2.2 Bushfire hazard overlay code. Again, this requirement is not required as Townsville City Council are considered a public sector entity, however, the key aspects of the code will still be considered as part of the overall bushfire assessment.

BFA maps are an indication of the potential for bushfire attack and are not a risk assessment of land. The Schedule 2.5 Overlay maps identifies two (2) categories of BFA; namely:

- **Medium bushfire hazard area:** which is considered to be a lower bushfire risk than High bushfire hazard areas, but higher than the excluded areas and represented as orange on the bushfire prone area map and is subject to a 30 metre buffer. This category has lower combustibility and/or limited potential fire size due to the vegetation area shape and size, land geography and management practices. This category consists of rainforests, lower risk vegetation parcels, Grasslands and remnant vegetation.
- **High bushfire hazard area:** which is considered to be high bush fire risk vegetation. It is higher in bush fire risk than Medium bushfire hazard areas (and the excluded areas) but lower than Very high bushfire hazard areas. It is represented as light red on a Bush Fire Prone Area map and is subject to a 30 metre buffer. This category consists of: woodlands, pine forests and shrublands.

The bushfire prone area mapping relevant to the Project is summarised in Table 2.

Table 2: Bushfire Prone Area Summary

Project location	Figure No.	Comment
Pump Station (Subject Land)	Figure 4	The BFA map does not identify the Pump Station as being impacted on by bushfire hazard vegetation. A risk based assessment has been performed by the project's design engineers and a suitable Asset Protection Zone (APZ) will be established to keep radiant heat levels at the infrastructure to below 40kW/m2 (BAL-40).
Laydown Storage Area (Subject Land)	Figure 5	The BFA map for the Laydown Storage Area has been correctly designated as Medium bushfire hazard vegetation.

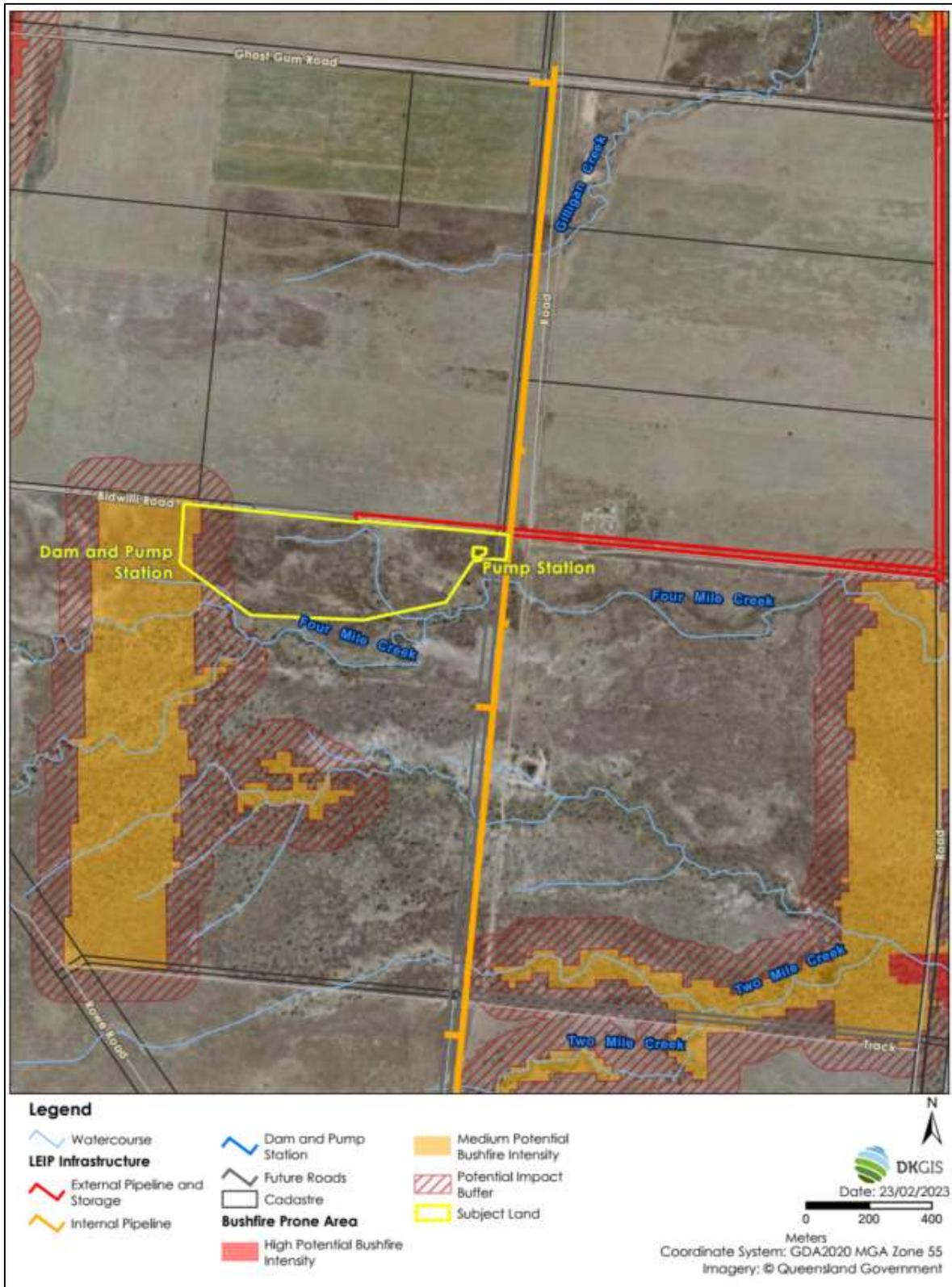


Figure 4: Bushfire Prone Area Map – Pump Station

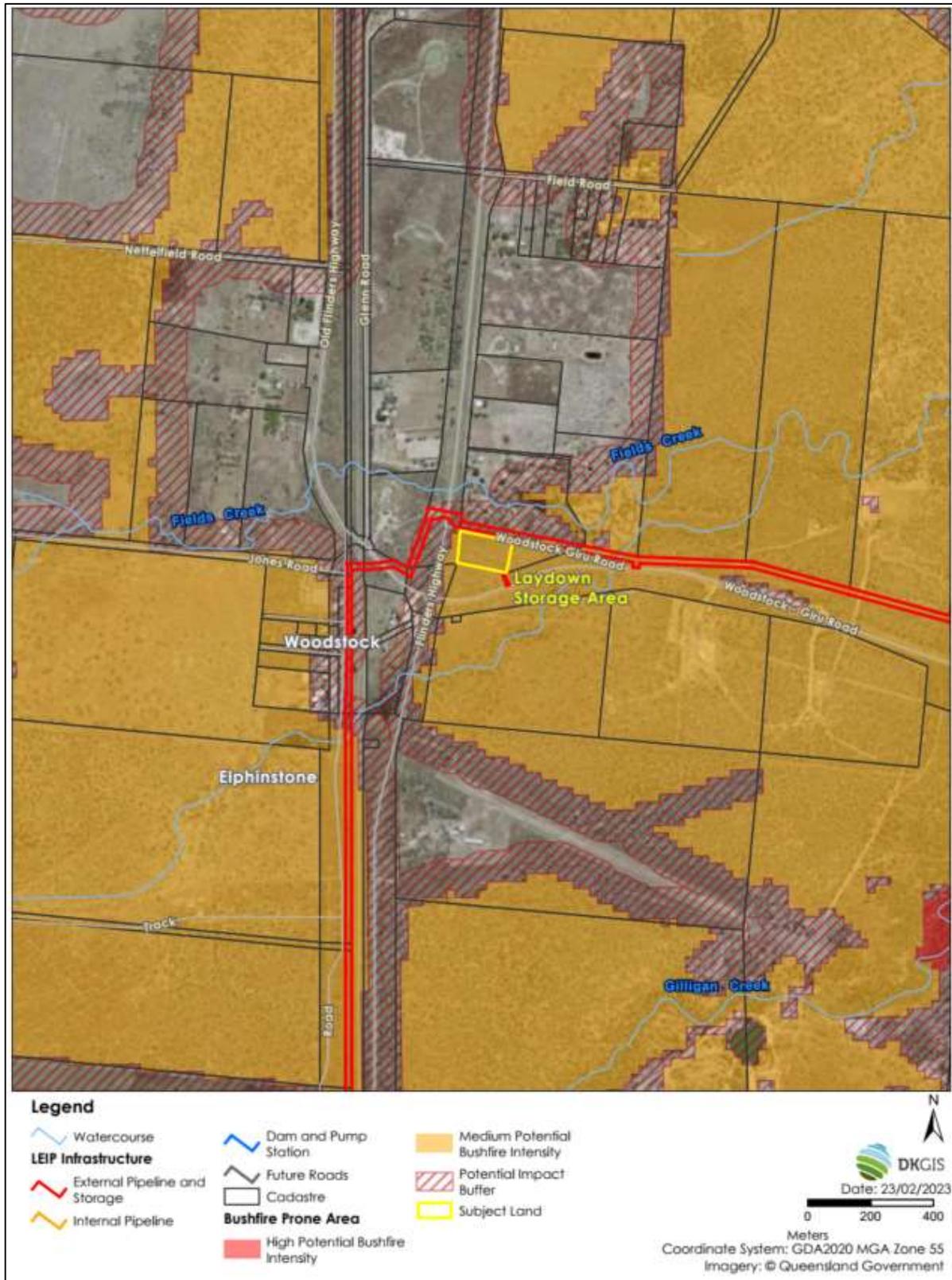


Figure 5: Bushfire Prone Area Map – Laydown Storage Area

5. Weather and Bushfire History

The typical / average climate in Woodstock (study area) is provided below:

Woodstock has a wet and a dry season. The wet season in Woodstock begins around November and ends around May. Over the course of the wet season, Woodstock receives around 1036.6mm of rain. By comparison, in the dry season from June to October, less than 93.8mm of rain falls in total. At the height of the wet season in February it rains on average 15.7 days in that one month.

Temperatures in the wet season average between 27.6 and 31.4°C during the day and 17.6 and 24.2°C overnight. Temperatures in the dry season average between 25 and 29.4°C during the day and 13.5 and 20.7°C at night.¹

The broader landscape has a history of large bushfires. The most significant fires were experienced between 2003 – 2013 within the Mingela State Forest to the west of the site and in 2019 in the bushland directly north of Woodstock Giru Road, refer to Figures 6 and 7.

Figures 6 and 7 shows the proximity of historically recorded bushfires and Fire Scars within the study area. Regardless of the fire history affecting the study area and the broader surrounding landscape, bushfires can occur at any time of the year. Table 2 summarises the bushfire prone nature of the land as described in Section 4. All parts of the study area can be subject to bushfire impact.

The annual Bush Fire Danger Period generally runs from October to the end of March, however it is not unusual for this period to be extended. Prevailing weather conditions associated with the bush fire season within the study area are north-westerly to south-westerly winds with moderate to high temperatures and moderate to high levels of humidity. Dry lightning storms occur frequently during the bushfire season. Periods of higher temperatures and lower humidity lasting several days also occur during the bush fire season.

The Australasian Fire and Emergency Services Council (AFAC) Bushfires and Community Safety Position Paper (p. 3) outlines nationally agreed positions for the fire services which states that:

Bushfire loss can be reduced or avoided in some cases but cannot be entirely prevented. A balance needs to be struck between measures taken to reduce or avoid harm and loss due to bushfire, and the protection of other values.

¹ Bonzle.com: Weather of Woodstock, QLD

The position paper (p. 3) recognises that:

Bushfire is a normal part of Australia's natural environment, particularly in eucalypt forests and grasslands. However, the frequency and intensity of bushfires varies throughout the landscape and the seasons. Bushfires are a common occurrence during the drier periods of the year in most places.

And that;

Bushfires of low or moderate intensity often pose little threat to life, property and community assets, but the potential for changes in wind direction can be a significant hazard. However, bushfires that burn in heavy fuels, steep terrain or on hot, dry and windy days often spread rapidly, crown in forests, produce powerful convection columns and create extensive spot fires ahead of the fire front, often making their control impossible until weather conditions moderate.

As the Fire Danger Rating reaches 'Extreme', bushfires are often described as 'firestorms' and become impossible to control. When the Fire Danger Rating approaches 'Catastrophic', the risk of serious injury or death to people in the path of a bushfire increases significantly, and many properties and other community infrastructure can become difficult or impossible to defend.

The QLD planning framework accepts this fundamental premise and the Townsville City Plan is based on credible worst-case fires affecting the Project site. The response to potential fires affecting the Project are determined by the risk management and Bushfire Protection Measures contained within Schedule 6.8 Mitigating bushfire hazard planning scheme policy and Section 8.2.2 Bushfire hazard overlay code, that are incorporated into the detailed design of the project.

The Townsville City Plan does not seek to stop fires, rather, it recognises the fundamental risk of bushfire affecting new development and puts in place minimum requirements to provide a tolerable approach to risk management. For critical infrastructure, it is up to the asset owner to determine the tolerable risk. The Project's design engineers have performed a detailed assessment on the critical infrastructure which is included within the specified Asset protection Zones in Section 12 of this report.

The project infrastructure is located within designated Bushfire Prone Areas. The project and broader landscape have a history of bushfires, and were impacted by large bushfires as recently as 2013 and 2019. Regardless of the fire history affecting the site and the broader surrounding area, bushfires can occur at any time of the year. All parts of the study area can be subject to bushfire impact.

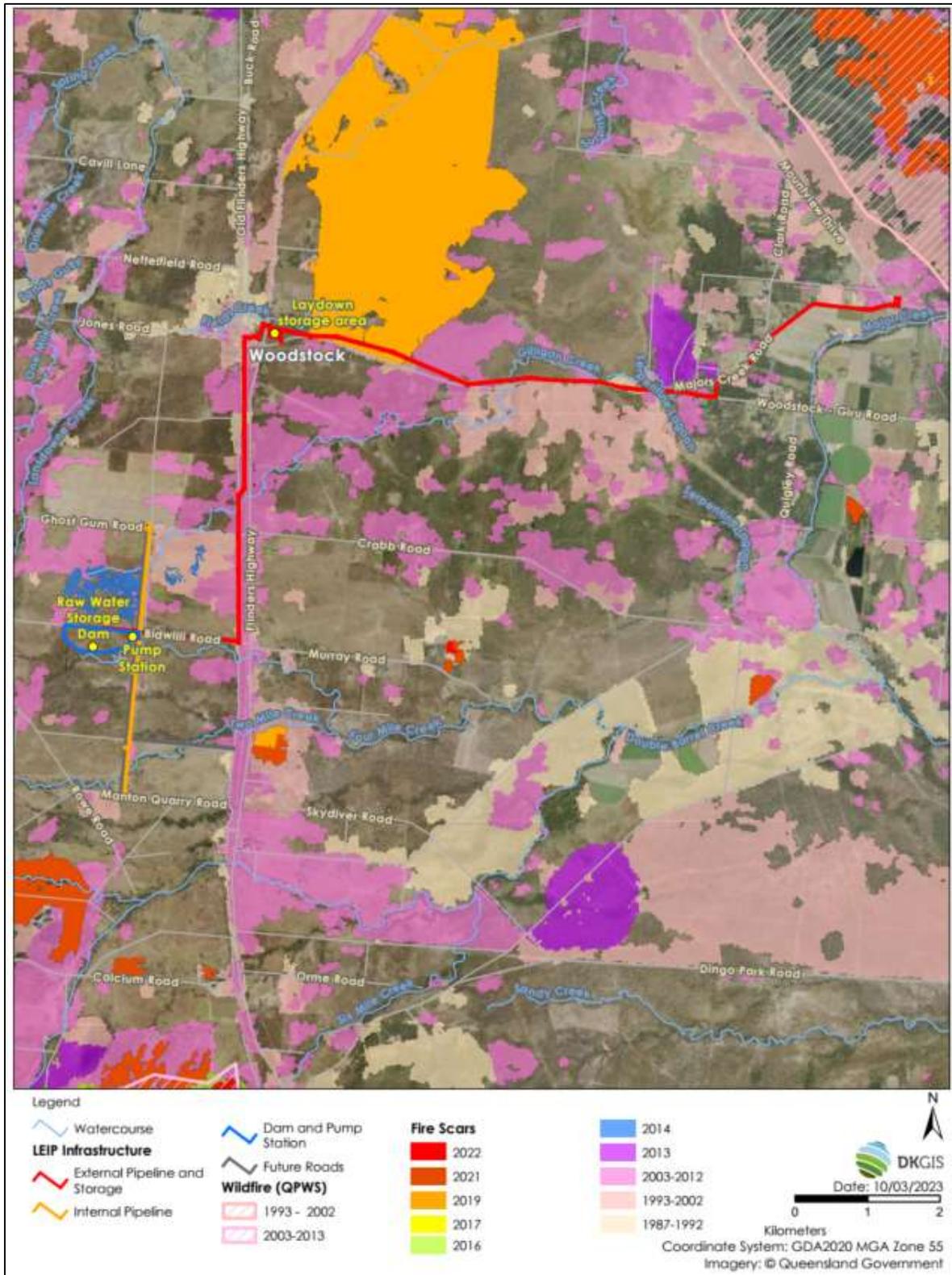


Figure 6: Fire History Map – Site Overview

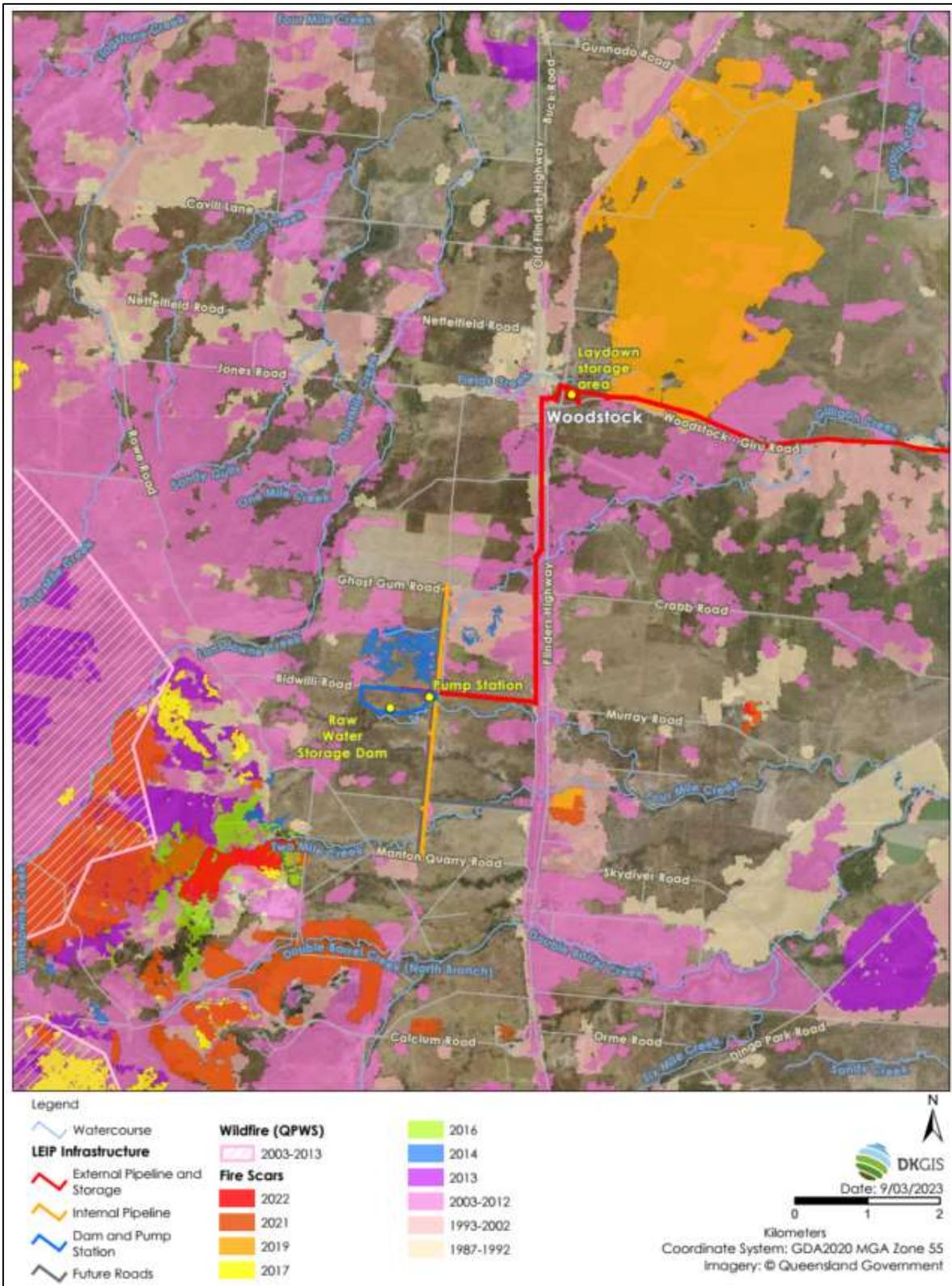


Figure 7: Fire History Map – Infrastructure Locations

6. Site Description and Proposed Development

Townsville City Council (TCC) is delivering the Lansdown Eco-Industrial Precinct Project (LEIP), Northern Australia's first environmentally sustainable advanced manufacturing, technology, and processing hub (refer to Figure 8). The LEIP will realise the objectives of the Townsville City Deal (a tri-partisan agreement spanning 15 years and all levels of government) to activate industry and export growth for Townsville and its regional partners as the Industry Powerhouse of the North. To facilitate the LEIP, various forms of infrastructure are required. Enabling infrastructure works will include road access to the northern part of the precinct and water supply infrastructure which includes a pipeline, a pump station and storage dam.

The LEIP has an area of approximately 2,200ha extending east from Mingela State Forest and Lansdown Creek to the Flinders Highway, 40km south of the Townsville CBD. The study area would be largely considered flat rural landscapes, with a high portion of predominantly managed agricultural land. There are pockets of vegetation scattered throughout the study area, which are mostly consistent with Open Woodlands (refer Figure 20).

Flinders Highway and Woodstock Giru Road are the existing main arterial roads that traverse the study area and provide connection between the infrastructure sites (pump station and laydown area). Flinders Highway and Woodstock Giru Road are sealed all-weather public roads. The proposal includes for road upgrades to provide suitable all-weather access to the new and existing infrastructure, refer to Table 3.

The LEIP will result in significant economic benefit to the local, regional and State economy. The LEIP is located approximately 38 km south of Townsville, adjacent and west of Flinders Highway. The enabling infrastructure is contained within the LEIP site and numerous existing road reserves including Flinders Highway, Woodstock Giru Road, Major Creek Road, Jones Road, Woodstock Avenue, Old Flinders Highway, No Name Road, Unnamed Road, Ghost Gum Road and Bidwilli Road. To facilitate the development of the LEIP, enabling infrastructure is required and a summary of project components is outlined in Table 3.

Table 3: Summary of project components forming LEIP enabling infrastructure

Project Component	Description Summary
Water Infrastructure	
External Pipeline	<ul style="list-style-type: none"> Extends from Ross River Dam Pipeline, connecting existing water supply network to LEIP; Connection occurs adjacent to three intersection junctions at Majors Creek; Total length of 16.25 km, within a 20 m construction corridor; 4.5 m from the nearest property boundary; Constructed using DN900 glass reinforced polymer (GRP) pipe; and Pipeline protection, erosion control and scour prevention materials used.
Internal Pipeline	<ul style="list-style-type: none"> Installed within the No Name Road existing and new road reserve from Ghost Gum Rd to Manton Quarry Rd; and Various diameters including DN250 to DN500.
Storage Dam	<ul style="list-style-type: none"> Proposed immediately south of Bidwilli Road at the termination of the external pipeline; Occupies an area of approximately 26 ha; Storage capacity of approximately 437 ML; and Access via Bidwilli Road.
Internal Pump Station	<ul style="list-style-type: none"> New pump station east of the storage dam; Connects storage dam and internal pipeline; and Access via Bidwilli Road.
Site Laydown Area	<ul style="list-style-type: none"> Approximately 1.7 ha in area, north east of Flinders Highway and Woodstock Giru Road intersection.
Access Roads	
Jones Road to Flinders Highway Upgrade	<ul style="list-style-type: none"> Modifications to existing roads and intersections required; and All roads are existing sealed roads within road reserves.
Jones Road Intersection Upgrade	<ul style="list-style-type: none"> Existing road; Connection to No Name Road (north) via a new intersection; and Upgraded for approximately 900 m in length to connect to Old Flinders Highway.
Closure of Existing Level Crossings	<ul style="list-style-type: none"> Two existing level crossings will be closed; and No change to land tenure, road reserves or road infrastructure.
No Name Road (north) Upgrade	<ul style="list-style-type: none"> Extends 1.7 km from northern LEIP boundary to Jones Road; New road, 10 m wide road drainage easement, plus an existing 20 m road reserve; and Designed to accommodate heavy vehicles.
No Name Road (south) Upgrade	<ul style="list-style-type: none"> New, 10 m wide road pavement within a new 30 m road reserve; and Extends approximately 2.2 km from Bidwilli Road to Manton Quarry Road.
Bidwilli Road	<ul style="list-style-type: none"> Minor modifications required to connect to No Name Road (south) and provide access to internal pump station and storage dam.
Unnamed Road	<ul style="list-style-type: none"> East-West road north of Manton Quarry Road. Road corridor to be 20 m wide. New, 10 m wide road pavement within an existing 20 m road reserve; and Extends approximately 1.7 km from No Name road (south) to Flinders Highway

Project Component	Description Summary
Flinders Highway Upgrade	<ul style="list-style-type: none"> Shoulder widening required. The shoulder widening works are contained within the existing Flinders Highway road reserve
Creation of Easements	<ul style="list-style-type: none"> 45 m wide easement on western side of No Name Road (south); A 10m wide easement on the northern side of Unnamed Road; and A 20m wide easement within the southern side of the existing Ghost Gum road reserve.

The study area includes the following Lots:

Table 4: Summary of project lots

Lots intersected by the enabling infrastructure include:	
Lot Number	Zoning
• Lot 19 RP901592	High Impact Industry
• Lot 34 E124243	High Impact Industry
• Lot 87 RP911426	Sports and Recreation
• Lot 51 E124242	High Impact Industry
• Lot 55 E124248	High Impact Industry
•	
• Lot 65 E124264	High Impact Industry
• Lot 161 SP130027	Community Facilities
• Lot 74 RP843344	Community Facilities
• Lot 5 RP800794	Rural
• Lot 130 EP1764	Rural
• Lot 118 EPS532	Rural
The pipeline runs along the boundaries of the below lots:	
Lot Number	Zoning
• Lot 118 EP532	Conservation
• Lot 4 RP904776;	Rural
• Lot 3 RP904776	Rural
• Lot 2 RP904776	Rural
• Lot 1 RP904776	Rural
• Lot 2 SP107189;	Rural
• Lot 1 SP107189	Rural
• Lot 2 SP300804;	Rural
• Lot 1 RP725371;	Rural
• Lot 2 RP737764;	Rural
• Lot 1 RP739582;	Rural
• Lot 132 EP1937	Community Facilities
• Lot 17 RP708526	Community Facilities
• Lot 22 RP709474;	Rural
• Lot 21 RP709474;	Rural
• Lot 1 RP719505;	Rural
• Lot 2 RP719505;	Rural

Lots intersected by the enabling infrastructure include:	
• Lot 23 RP710083;	Rural
• Lot 1 E2369	Rural

The proposed development will necessitate consideration under the Planning Scheme 8.2.2 Bushfire Hazard Overlay Code, with the following applicable assessment benchmarks (Table 8.2.2.3):

- General – all development: **PO1 – PO9**.

The compliance table for the assessment benchmarks is included in Section 21.3 of this report, which has been assessed using expert judgement.

A site inspection was not performed under the scope of this assessment.

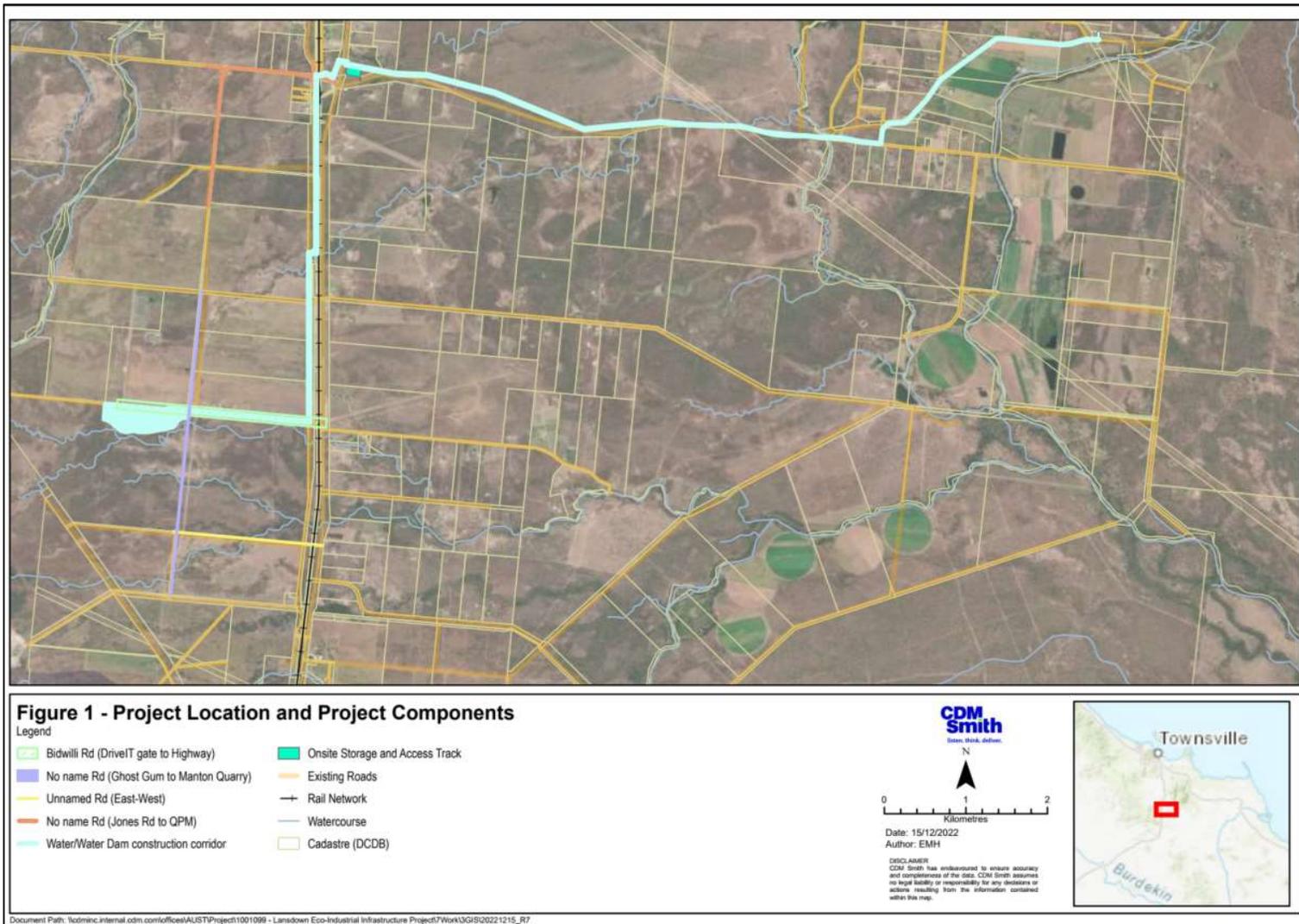


Figure 8: Proposed Development

7. Assessment Framework

The Department of Climate Change, Energy, the Environment and Water (The Department) is the planning and consent authority for the Project and the planning approval from the Queensland State Government, including the relevant fire service or the local council are not required. However, the Townsville City Plan Section 8.2.2 Bushfire hazard overlay code will be utilised to inform the Bushfire management Plan and overall bushfire assessment.

The preparation of this Bushfire management Plan and associated bushfire risk assessment is at the request from The Department:

“The Department notes the referral includes a detailed description of the proposed avoidance, mitigation and management measures to be implemented by the proponent during the construction, operation and maintenance stages of the proposed action. The referral states that the following relevant management plans will be developed prior to the commencement of the proposed action:

- *Construction Environmental management Plan*
- *Weed and Pest Animal Management Plan*
- ***Bushfire Management Plan***”

The consultation pathway for the engagement and acceptance of agency input with the Queensland State Government and Fire Services will need to be determined by the Project Team.

The assessment of the critical infrastructure has been undertaken in accordance with the framework and methodology outlined by AS3959:2018 to determine the Bushfire Attack Level (BAL). AS3959:2018 identifies the methodology to determine BALs based on the calculated radiant heat levels at a given site. This assessment is based on mapping of vegetation formations and slope assessment in accordance with AS3959:2018. This assessment is based on the desktop assessment of the sites utilising the following resources:

- AS3959:2018;
- Aerial mapping; and
- Detailed GIS analysis.

Before construction requirements and/or infrastructure specifications can be determined, it is first necessary to determine the BAL by an assessment of the subject site and the classified vegetation impacting on the site. There are two methods identified within AS3959 (p. 18) to determining BALs:

Method 1—A simplified procedure (acceptable solutions) that involves five steps to determine BALs, which is subject to limitations on the circumstances in which it can be used; and

Method 2—A detailed procedure, set out in Appendix B, using calculations to determine BALs, appropriate where a more specific result is sought or where the site conditions are outside of the scope of Method 1.

BALs are used to determine which, if any, construction requirements contained in Sections 3 to 9 of AS3959:2018 are appropriate for a particular site. Method 1 uses acceptable solutions to meet the Building Code of Australia (BCA) for bushfire construction. Method 2 uses alternative solutions and performance-based assessments to meet the BCA. All BAL assessments provided in this report have been completed using Method 1 of AS3959.

For the Blackash's Method 1 assessment, the following steps, as outlined in AS3959:2018 (p. 15) have been used to determine the relevant BALs. The steps are summarized in Table 5:

Table 5: Simplified Procedure AS3959

Step	Procedure
Step 1	Determine the relevant FDI
Step 2	Determine the classified vegetation type(s)
Step 3	Determine the distance of the site from the classified vegetation type(s)
Step 4	Determine the effective slope(s) under the classified vegetation type(s)
Step 5	Determine the BAL from the appropriate table
Step 6	Determine the appropriate construction requirements

Bushfire Hazard

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as likely radiant heat and APZ. The vegetation formations (bushfire fuels) and the topography (effective slope) combine to create the bushfire threat that may affect bushfire behaviour at the site, and which determine the Bushfire Attack Level (BAL) of AS3959:2018.

Fire weather

The fire weather is dictated by AS3959:2018 and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds. The jurisdictional and regional values for FDI are demonstrated in Table 2.1 of AS3959:2018 which are also shown in Table 6 below.

Table 6: Jurisdictional and regional values for FDI (source AS3959:2018 p. 14)

State/ Region	Source Document	FDI
NSW	AS3959 (The vegetation classification was refined using the NSW RFS Planning for Bushfire Protection 2019)	(a) Greater Hunter, Greater Sydney, Illawarra/Shoalhaven, Far South Coast and Southern Ranges fire weather districts - 100 (b) NSW alpine areas - 50 (c) NSW general (excluding alpine areas, Greater Hunter, Greater Sydney, 80 Illawarra/Shoalhaven, Far South Coast and Southern Ranges fire weather districts - 80
Victoria	AS3959	(a) Victoria alpine areas - 50 (b) Victoria general (excluding alpine areas) - 100
Western Australia	AS3959	WA general - 80
Queensland	AS3959	Qld general - 40

Due to advances in the Queensland State and Regional mapping resources, Blackash have provided the site specific FDI for the study area (refer Figure 13). The identified FDI is consistent across the study area and an FDI of 59 is applicable to the assessment. Blackash with the use of Method 1 BAL determination, have taken a conservative approach and applied Table 2.5 (p. 30) of AS3959:2018 which stipulates an FDI of 80.

This assessment has used a bushfire risk methodology as identified within AS3959:2018. The methodology looks broadly at the strategic level and landscape scale risks including the bushfire history and bushfire prone nature of the study area. Focussed assessments have been completed for the key project assets to determine the bushfire risk and associated APZs that mitigate the risk to and from these assets. From an impact assessment perspective, the establishment and ongoing management of APZs has a consequential impact to biodiversity which will need to be assessed by the project team. The ongoing maintenance and management of APZs would require implementation for both the construction and operational phases of the project to reduce the intensity of bushfire at the specific above ground parts of the asset.

8. Townsville City Plan (Version 2022/02)

The commencement date for the Townsville City Plan was 27 October, 2014. The Townsville City Plan was amended for alignment with the *Planning Act 2016* (the Act) by the Minister's rules under section 293 of the Act on 27 June 2017.

Section 8.2.2 of the Townsville City Plan relates to the bushfire hazard overlay code. The purpose of the Bushfire hazard overlay code is to ensure that development does not:

- a. increase the extent or the severity of bushfire hazard; or
- b. increase the risk to life, property, community and the environment.

8.1. Categories of development and assessment

The tables in Part 5 Tables of assessment identifies the category of assessment and assessment benchmarks that require addressing for a proposed development under the Townsville City Plan. As there is Material Change of Use associated with the proposed development (Utility Installation), Section 5.5 Categories of development and assessment - Material change of use is applicable. Section 5.5 identifies the categories of development and assessment and the corresponding assessment benchmarks for assessable development and accepted development for development in a specific zone for making a material change of use. Figures 9 - 13 below are provided for each of the relevant land zones for the project area, refer to Table 4.

All applicable land zones for the proposed Material Change of Use and specifically Utility Installation, states:

"If provided by a public sector entity – No assessment benchmarks apply".

Under Part 5 Tables of assessment, the Bushfire hazard overlay code does not apply to the development.

Table 5.5.21 - Rural zone		
Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Animal husbandry Editor's note—Council's local laws also establish requirements regarding the keeping of animals. Emergency services Landing Editor's note—Landings are separately regulated under the Prescribed Tidal Works Code. Park	Accepted development	
		No assessment benchmarks apply
Intensive horticulture	Accepted development	
	If not a mushroom farm	No assessment benchmarks apply
Animal keeping Editor's note—Council's local laws also establish requirements regarding the keeping of animals.	Accepted development	
	If not a cattery or kennel	No assessment benchmarks apply
	Assessable development - Code assessment	
	If a cattery or kennel in the Mixed farming precinct or Grazing precinct	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Cropping	Accepted development	
	If other than forestry for wood production	No assessment benchmarks apply
Community use Cemetery Crematorium	Accepted development	
	If provided by a public sector entity	No assessment benchmarks apply
	Assessable development - Code Assessment	
	Otherwise	Rural zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Major electricity infrastructure Substation Utility installation	Accepted development	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	Accepted development	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Rural zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code

Figure 9: Rural zone

Table 5.5.14 - Sport and recreation zone		
Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Dwelling house Dual occupancy <small>Editor's note—This category of development and assessment may also be altered by the Water resource catchment, Flood hazard, Coastal environment and Landslide hazard overlays. Refer to Table 5.5.1.</small>	Accepted development	
	If in the Balgal Beach golf course precinct	No assessment benchmarks apply
Landing <small>Editor's note—Landings are separately regulated under the Prescribed Tidal Works Code.</small>	Accepted development	
		No assessment benchmarks apply
Park		
Major electricity infrastructure Substation Utility installation	Accepted development	
	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	Accepted development	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Assessable development - Code assessment	
	Otherwise	Sport and recreation zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
Caretaker's accommodation	Accepted development subject to requirements	
		Sport and recreation zone code Works code

Figure 10: Sport and recreation zone

Table 5.5.16 - Community facilities zone		
Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing Editor's note—Landings are separately regulated under the Prescribed Tidal Works Code.	Accepted development	
Park		No assessment benchmarks apply
Major electricity infrastructure Substation	Accepted development	
Utility installation	If provided by a public sector entity	No assessment benchmarks apply
Telecommunications facility	Accepted development	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
Caretaker's accommodation Community care centre Community residence Community use Emergency services	Accepted development subject to requirements	
		Community facilities zone code Works code
Child care centre Educational establishment Health care services Indoor sport and recreation Market Outdoor sport and recreation Place of worship Retirement facility Residential care facility Rooming accommodation	Assessable development - Code assessment	
		Community facilities zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
Bar Club Shop	Assessable development - Code assessment	
	If the gross floor area does not exceed 250m ² Editor's note—The gross floor area threshold is calculated for a new use or an extension to an existing use. It is not the cumulative total of the existing use and the additional gross floor area forming part of the development application.	Community facilities zone code Healthy waters code Landscape code Transport impact, access and parking code Works code

Figure 11: Community facilities zone

Table 5.5.17 - Environmental management and conservation zone		
Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing <small>Editor's note—Landings are separately regulated under the Prescribed Tidal Works Code.</small>	Accepted development	
Park		No assessment benchmarks apply
Major electricity infrastructure Substation Utility installation	Accepted development If provided by a public sector entity	No assessment benchmarks apply
	Assessable development - Code assessment	
Dwelling house		Environmental management and conservation zone code Works code
	Assessable development - Code assessment	
Telecommunications facility		Environmental management and conservation zone code Telecommunications facilities and utilities code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Assessable development - Code assessment	
Outdoor sport and recreation		Environmental management and conservation zone code Healthy waters code Landscape code Transport impact, access and parking code Works code

Figure 12: Environmental management and conservation zone

Table 5.5.20 - High impact industry zone		
Use	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Landing <small>Editor's note—Landings are separately regulated under the Prescribed Tidal Works Code.</small>	Accepted development	
Park		No assessment benchmarks apply
Sales office		No assessment benchmarks apply
	Accepted development	
	If provided by a public sector entity	No assessment benchmarks apply
	Assessable development - Code assessment	
Major electricity infrastructure Substation Utility installation	Otherwise	Telecommunications facilities and utilities code High impact industry zone code Healthy waters code Landscape code Transport impact, access and parking code Works code
	Accepted development	
	If aerial cabling for broadband purposes	No assessment benchmarks apply
	Accepted development subject to requirements	
Telecommunications facility	Otherwise	High impact industry zone code Telecommunications facilities and utilities code Works code
	Accepted development subject to requirements	
Caretaker's accommodation		High impact industry zone code Works code

Figure 13: High impact industry zone

8.2. Bushfire Hazard Overlay Maps

The site is identified on the Townsville City Plan Schedule 2.5 Development constraints overlay map OM-02 (Bushfire hazard). As part of Blackash's independent assessment, the subject site was reviewed using Queensland Government data mapping sources (data.qld.gov.au) and determined to be a Bushfire Prone Area (BPA), refer to Figures 3, 4 and 5. As such, Blackash's assessment has provided consideration of the Townsville City Plan bushfire hazard overlay code.

For the purposes of section 32(a) of the Building Act 1975 and part 3 Section 12 of the Building Regulation 2006, Schedule 2.5 of the Townsville City Plan provides local governments with the trigger points for the application of AS 3959:20018 – Construction of buildings in bushfire prone areas on sites that are considered 'designated bushfire prone areas'. The development does not incorporate the construction of any dwellings, however the Pump Station is a Class 10 structure and should be designed and constructed in compliance with AS 3959:2018 and BAL-40, as per the project engineers independent assessment on bushfire heat tolerance (kW/m²).

The subject site is considered to be and impacted on by designated bushfire prone areas under the Townsville City Plan, with the level of bushfire hazard areas demonstrated in Figures 3, 4 and 5.

The Bushfire Hazard Overlay Maps provide the basis for the development assessment provisions and consideration of sites that represent a bushfire hazard. A Bushfire hazard area is land that has been identified by council, which can support a bushfire or is subject to bushfire attack and to show the level of risk assessed by Council.

Figures 4 and 5 demonstrates the potential bushfire hazard applicable to the water infrastructure:

- Pump Station (Figure 4) – not mapped as or impacted on by potential bushfire hazards; and
- Laydown Storage Area (Figure 5) – mapped as Medium bushfire potential intensity.

Due to the 'Medium bushfire potential intensity' for the Laydown Storage Area, Table 5.9.1 – Assessment benchmarks for overlays (medium hazard area) are applicable. For the Material Change of Use, the assessment benchmark states (refer Figure 14):

"Bushfire hazard overlay code where the development is assessable development under the categories of development and assessment for the relevant zone."

As per Section 8.1 of this report, there are no development benchmarks applicable to projects land zoning. With consideration of Table 5.9.1, the bushfire hazard overlay code does not apply to the development.

Bushfire hazard overlay (medium hazard area)		
Table 5.9.1 - Assessment benchmarks for overlays		
Development	Categories of development and assessment	Assessment benchmarks for assessable development and requirements for accepted development
Bushfire hazard overlay (medium hazard area)		
Any material change of use	No change to the category of development and assessment	Bushfire hazard overlay code where the development is assessable development under the categories of development and assessment for the relevant zone. <small>Editor's note—This overlay code is not applicable to accepted development subject to requirements development.</small>
Reconfiguration of a lot	No change to the category of development and assessment	Bushfire hazard overlay code where the development is assessable development under the categories of development and assessment for reconfiguration of a lot.

Figure 14: Bushfire hazard overlay (Medium hazard area)

8.3. Bushfire Hazard Overlay Code

The Townsville City Plan notes that the purpose of the Bushfire hazard overlay code (refer to Section 8 of this report) will be achieved through the following overall outcomes:-

- a. development is compatible with the nature of the bushfire hazard except where there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal;
- b. where development is not compatible with the nature of the bushfire hazard and there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal; and
- c. wherever practicable, facilities with a role in emergency management and vulnerable community services are located and designed to function effectively during and immediately after bushfire hazard events.

Compliance with the outcomes of the Bushfire hazard overlay code have been assessed utilising expert judgement and included in Section 21.1 of this report.

8.4. Mitigating bushfire hazard planning scheme policy

Schedule 6.8 (SC6.8) Mitigating bushfire hazard planning scheme policy within the Townsville City Plan has the following stated purpose:

- a. Support the outcomes presented in the Bushfire hazard overlay code; and
- b. Provide guidance and information relating to the preparation of a Bushfire hazard assessment, and where necessary a Bushfire management plan.

Compliance with the specified points of purpose has been assessed utilising expert judgement and included in Section 21.2 of this report.

9. Bushfire Hazard Assessment

The bushfire assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape. The likelihood of a bushfire, its severity and intensity, and the potential impact on life and property varies depending on where a site is located in the landscape. There are a number of factors that influence the potential bushfire behaviour at a landscape scale, including:

- extent and continuity of vegetation;
- topography;
- Accessibility of the landscape for fire response and fire suppression. This can greatly influence the potential fire-fighting strategies and their success;
- the potential fire run (potential size of the fire determined by available fuel) and area that is likely to be impacted by the fire. For example, a large bushfire may impact areas many kilometres in front of the main fire;
- the location and exposure of urban areas, townships, and isolated rural areas to a bushfire; and
- the extent of neighbourhood-scale damage the bushfire may produce.

The Project (Figure 1) includes designated BFA which is subject to a range of environmental and topographical features including complex water catchments, escarpments, bushfire vegetation corridors, existing farming land and physical assets which have been considered in the potential fire behaviour characteristics.

The Project is exposed to both landscape scale risk (broader landscape) and localised bushfire risk. It is located within a landscape comprising areas of relatively complex terrain with a mix of remnant forest and woodland areas, and grassland hazards which are likely to result in varied fire behaviour based upon localised terrain, fuel and wind conditions.

Grassland fires are fast moving fires that often move quickly through the landscape and are highly dependent on curing (dryness of the grass) and the underlying dryness of the landscape. They can generate enormous amounts of heat, with an average flame height from between 2 to 5 metres. The taller and drier the grass, the more intensely it burns.

Blackash have performed an independent assessment and review for the bushfire risk posed to the infrastructure sites, which is demonstrated in the following sections.

9.1. Vegetation Hazard Classes

The bushfire prone area mapping as utilised as the basis for the bushfire assessment process, adopts the methods as prescribed in the document 'A new methodology for State-wide mapping of bushfire prone areas in Queensland'. The purpose of the bushfire assessment process is to perform an independent review of the site specifics through mapping and modelling of spatial factors to review the risk of bushfire posed to the subject site.

Vegetation Hazard Classes (VHC) are provided by the Queensland Government data portal as indicative fuel loads for areas of vegetation and are measured in tonnes per hectare. Generally, a higher fuel load equates to a higher risk profile for an area of vegetation due to the increased levels of radiant heat being generated by bushfire events in those areas where vegetative fuels are more abundant.

The VHC that are impacting on the Project are:

- Pump Station:
 - Fuel load of 5 tonne per hectare.
- Laydown Storage Area:
 - West – fuel load of 5 tonne per hectare;
 - North – fuel load of 3 tonne per hectare; and
 - South & East – fuel load of 18 tonne per hectare.

The extent of the mapped VHC within the subject site was reviewed using a combination of recent aerial photography, GIS mapping and data from the Queensland Government data portal, refer to Figures 15, 16 and 17.

Blackash support the fuel load designations as offered by the Queensland Government data portal, which align with the 'Grassland' and 'Open Grassy Woodland' vegetation types as provided in the vegetation assessment in Section 10.4.

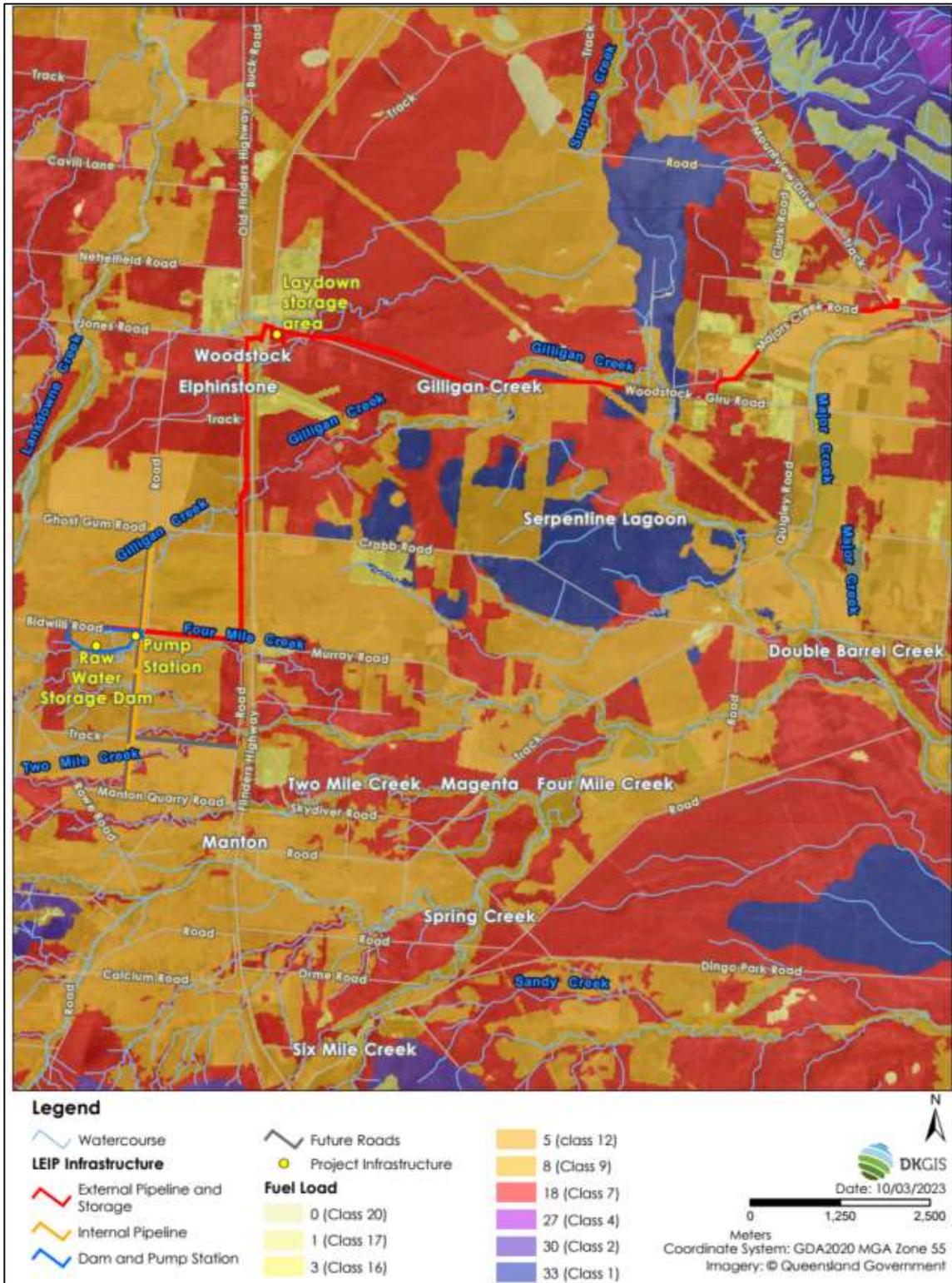


Figure 15: Vegetation Hazard Class Map – Site Overview

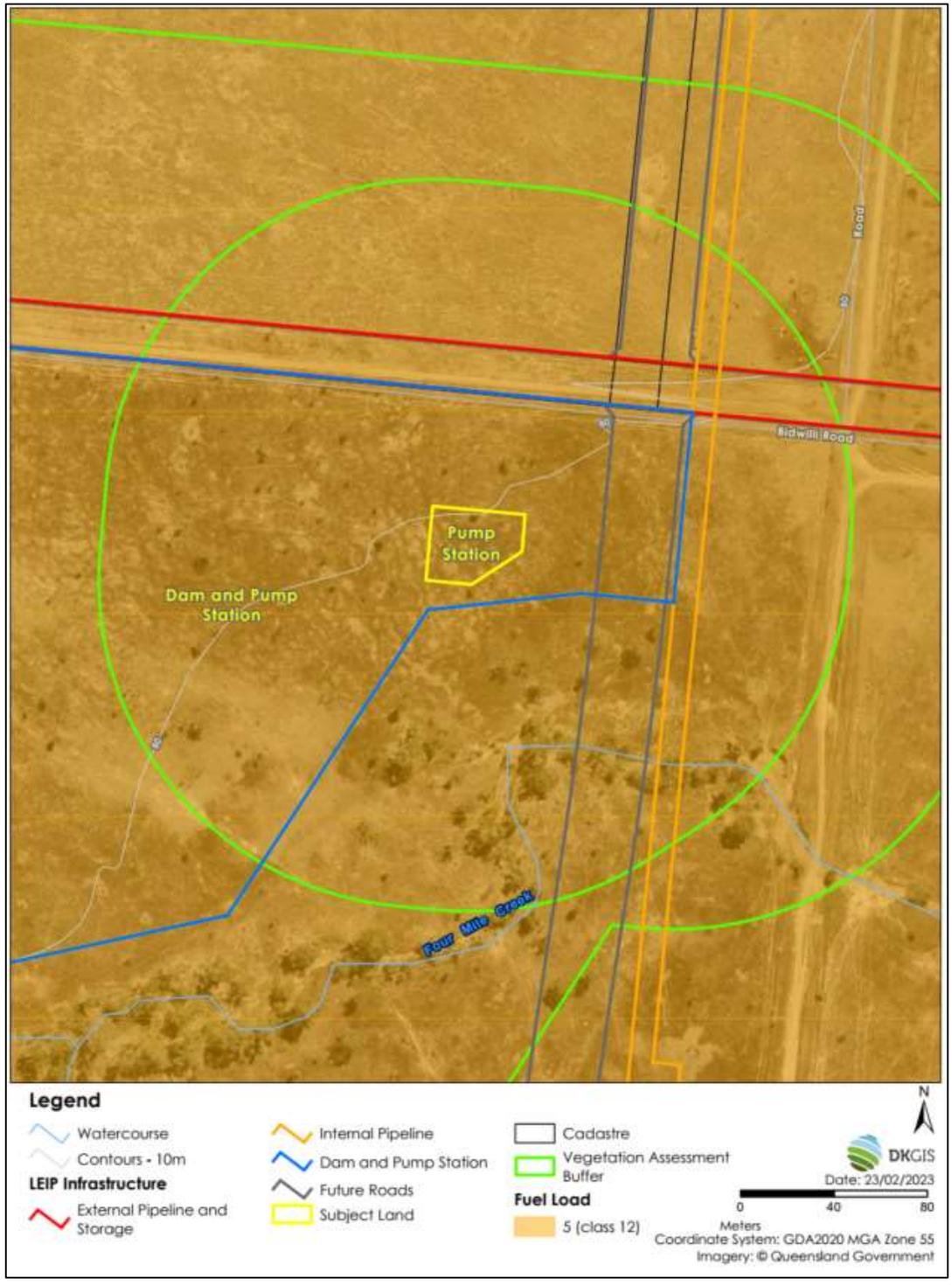


Figure 16: Vegetation Hazard Class Map – Pump Station (Subject Land)

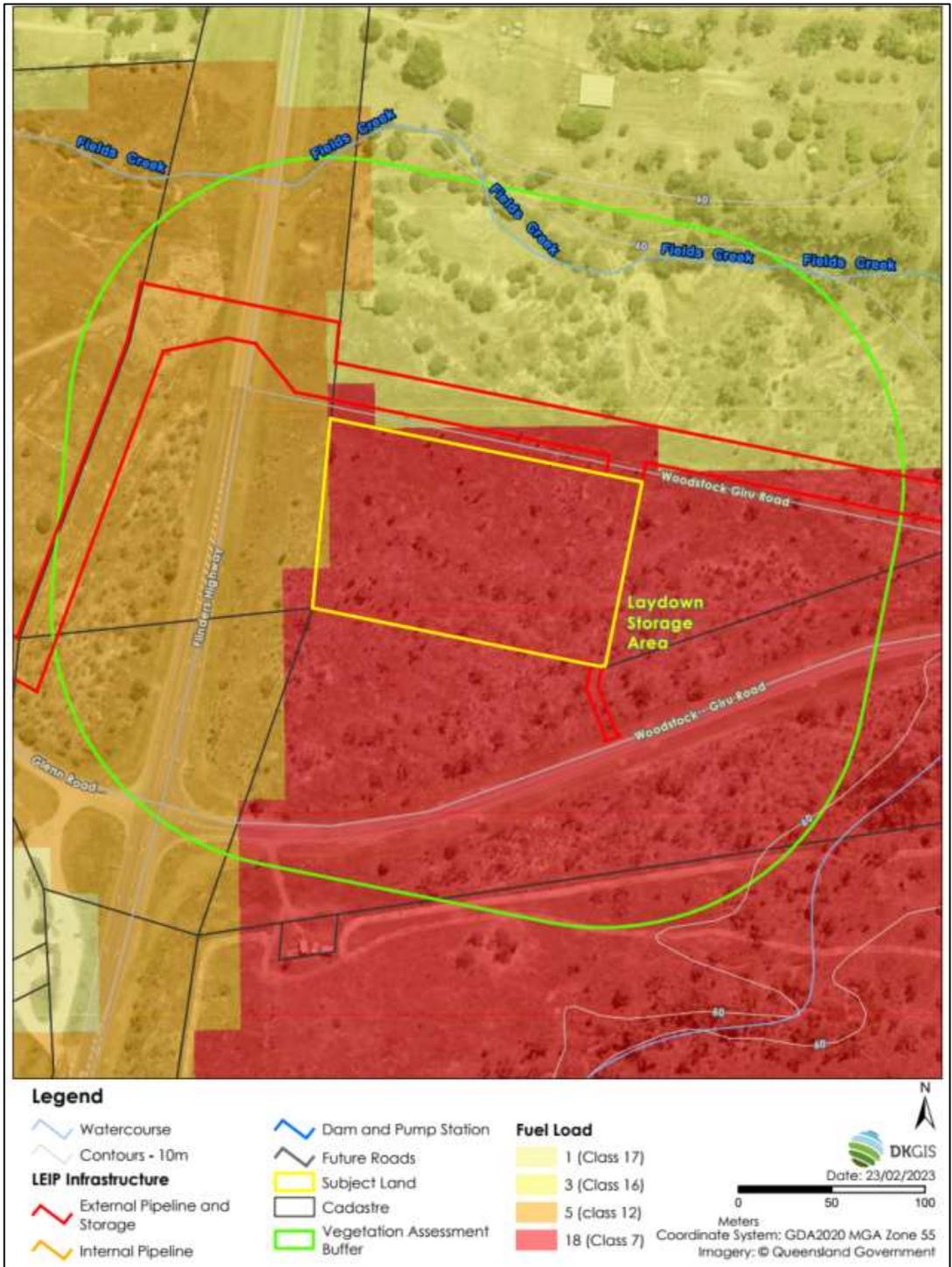


Figure 17: Vegetation Hazard Class Map – Laydown Storage Area (Subject land)

9.2. Fire Weather

Bushfires are a normal part of the landscape in North Queensland and are predicted to become more severe, more frequent and an increasingly common part of life. Climate change modelling predicts increasing frequency and severity of fire events correlating with altered rainfall and drought patterns and increasing numbers of severe and intense heat events. As the dryness of more areas increases beyond levels historically considered 'normal', the footprint of areas with a propensity to burn are likely to increase. AS3959:2018 assumes a credible worst-case fire burning under a 1:50 year weather or fire event. This design fire could underrepresent the intensity and frequency of bushfires with climate change.

Fire weather severity is presented as a Fire Danger Index (FDI), which identifies the chance of a fire starting, its rate of spread, its intensity and the difficulty potential for its suppression, considering various factors such as temperature, humidity, wind and drought effects. As such, a higher FDI equates to a higher bushfire risk profile for an area of vegetation.

Fire weather is dictated by AS3959:2018 and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds.

Due to advances in the Queensland State and Regional mapping resources, Blackash have provided the site specific FDI for the subject site (refer Figure 19). The identified FDI is consistent across the subject site and an **FDI 59** is applicable to the Project.

AS3959:2018 does not provide an acceptable solution (Deemed-to Satisfy) for an FDI of 59. Queensland has a Jurisdictional and Regional Value for an FDI 40 in AS3959:2018, which is not supported by the Townsville City Plan. As such, for the purpose of the assessment, Blackash have used the acceptable solutions from Table 2.5 of AS3959:2018 for an **FDI 80**.

9.3. Vegetation Characteristics

Predominant Vegetation is classified by structure or formation using the system adopted by AS3959:2018. The vegetation has been classified in accordance with Table 2.3 of AS3959:2018. Vegetation types give rise to radiant heat and fire behaviour characteristics. There are 12 vegetation formations (with sub-formations) identified in AS3959:2018. The predominant vegetation has been determined over a distance of at least 100 metres in all directions from the proposed work area / structure footprint on the site. Where a mix of vegetation types exist, the type providing the greater hazard is said to predominate. The mapping of vegetation has

been completed using available data sets and air photograph interpretation. Modification of vegetation may be completed following vegetation and ecological surveys.

Vegetation is the fundamental physical component of determining bushfire behaviour within a specified region. Vegetation provides the available fuel to be consumed by a bushfire. Fuel load and arrangement represents a considerable component in dictating the behaviour of fire in terms of intensity, rate of spread and flame height.

Vegetation type, density and arrangement can further influence fire behaviour and intensity. Vertical and horizontal continuity is also a significant element. Thus, vegetation is a key input to the bushfire risk assessment required by AS3959:2018 which forms a key consideration within this report.

9.4. Slopes Influencing Bushfire Behaviour

AS3959:2018 requires assessment of the effective slopes impacting on a subject site. The slope of the land under the classified vegetation (effective slope) has a direct influence on the rate of fire spread, the intensity of the fire and the ultimate level of radiant heat flux. The effective slope is the slope of the ground under the hazard (vegetation). In identifying the effective slope, it may be found that there are a variety of slopes covering different distances within the vegetation. The effective slope is considered to be the slope under the vegetation which will most significantly influence the bushfire behaviour for each transect. This is usually the steepest slope.

The 'effective slope' influencing fire behaviour has been assessed in accordance with the methodology specified within AS3959:2018. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 metre transect measured outwards from the development boundary. The slope assessment has been completed to determine the Bushfire Attack Level (BAL) at key project locations. The topography of the study area and surrounds are largely considered gently undulating or flat.

10. Bushfire Threat Assessment

10.1. Methodology

The LEIP bushfire assessment has been undertaken in accordance with the framework and assessment methodology outlined by AS3959:2018 (Method 1) to determine the Bushfire Attack Level (BAL) applicable to each of the sites. AS3959:2018 identifies the methodology to determine the BAL based on calculated radiant heat levels at a given site. This assessment is based on the mapping of vegetation formations and slope assessments in accordance with AS3959:2018.

As required by AS3959:2018 each interface area was divided and classified accordingly by vegetation type, slope class and associated distances for BAL Flame Zone, BAL 40, BAL 29, BAL 19 and BAL 12.5. Each site boundary was used as a basis for identifying the required APZ to achieve a specific radiant heat threshold. Where vegetation is existing, it can be managed to achieve a required radiant heat level.

The BAL is a means of measuring the ability of a building or structure to withstand attack from bushfire. The form of bushfire attack (wind, ember, radiant heat, direct flame contact) and the severity will vary according to the conditions (FDI, vegetation, slope and setback) for the assets being assessed. The project engineers have performed an independent assessment on bushfire heat tolerance (kW/m^2) applicable to the key project locations, which is included in Appendix 2.

The utilisation of the BAL and a range of other bushfire mitigation strategies for each of the items of infrastructure will provide an opportunity for an integrated approach with the surrounding land management and Fire Management Plans and strategies to ensure a cohesive approach is achieved in the management of the individual sites.

Heat flux exposure	Description	AS 3959 construction level
N/A	Minimal attack from radiant heat and flame due to the distance of the building from the vegetation, although some attack by burning debris is possible. There is insufficient threat to warrant specific construction requirements.	BAL-LOW
≤12.5	Attack by burning debris is significant with radiant heat (not greater than 12.5kW/m ²). Radiant heat is unlikely to threaten building elements (such as unscreened glass). Specific construction requirements for ember protection and accumulation of debris are warranted.	BAL-12.5
>12.5 ≤19	Attack by burning debris is significant with radiant heat flux (not greater than 19kW/m ²) threatening some building elements (such as screened glass). Specific construction requirements for embers and radiant heat are warranted.	BAL-19
>19 ≤29	Attack by burning debris is significant and radiant heat flux (not greater than 29kW/m ²) threatens building integrity. Specific construction requirements for ember and higher levels of radiant heat are warranted. Some flame contact is possible.	BAL-29
>29 ≤40	Radiant heat flux and potential flame contact could threaten building integrity.	BAL-40
>40	Significant radiant heat and significantly higher likelihood of flame contact from the fire front will threaten building integrity and result in significant risk to residents.	BAL-FZ

Figure 18: Radiant Heat Levels

10.2. Bushfire Hazard

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as APZ locations / dimensions and future building construction requirements in accordance with AS3959:2018. The vegetation formations (bushfire fuels) and the topography (effective slope) combine to create the bushfire threat that may affect bushfire behaviour at the site and which determine the building response of AS3959: 2018.

10.3. Fire weather (FDI)

The fire weather is dictated by the Queensland Government data portal and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds. The site has a Fire Danger Index (FDI) of 59, refer Figure 19. For the purpose of the assessment, Blackash have taken a conservative approach and utilised Table 2.5 of AS3959:2018 **FDI 80**.

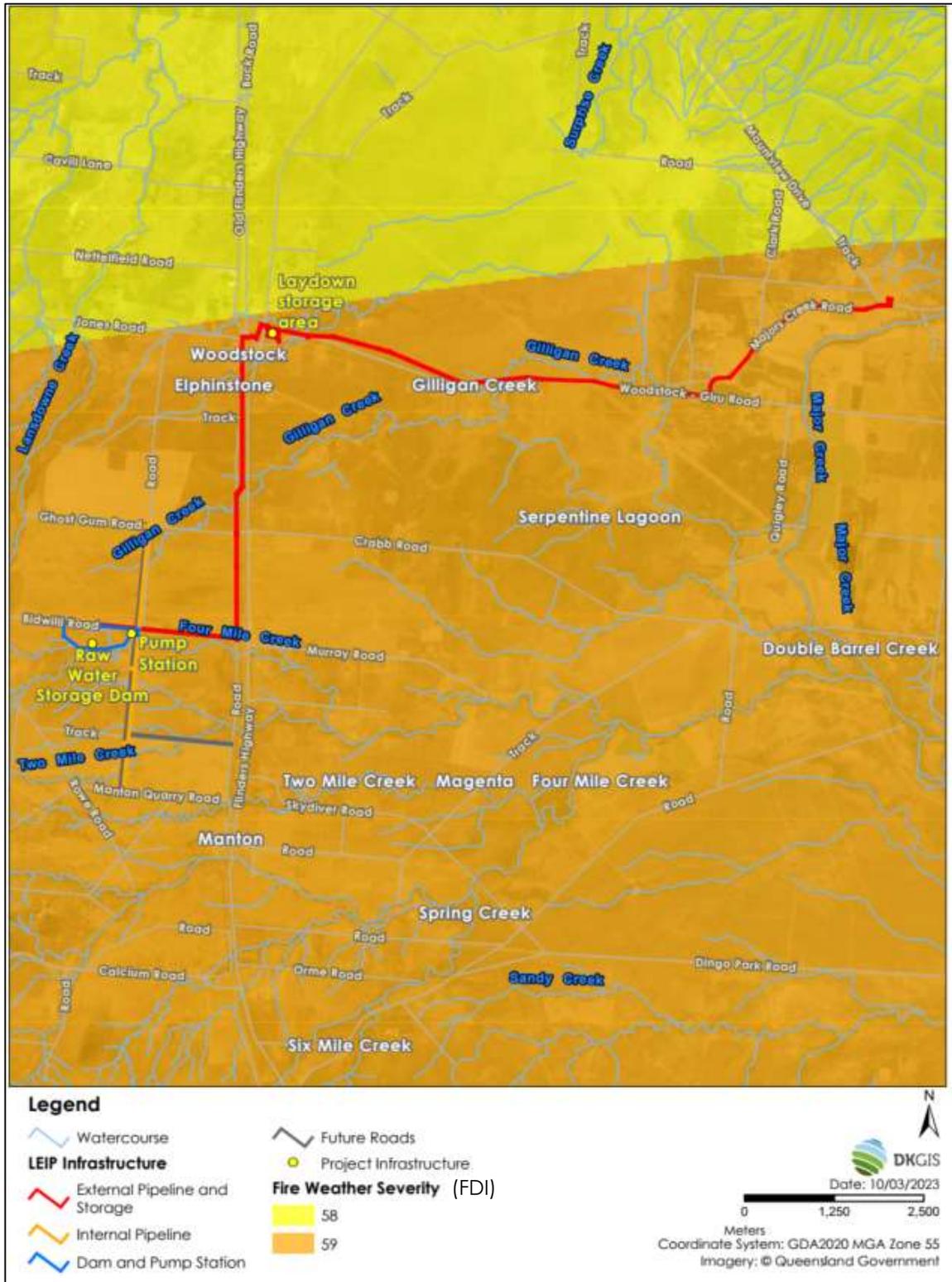


Figure 19: Fire Danger Index (FDI) Map – Site Overview

10.4. Vegetation Assessment

Predominant Vegetation has been classified by structure or formation utilising the general description as provided in AS3959:2018.

Blackash have utilised the vegetation as per Figures 20, 21 and 22 for the purpose of the assessment and based the vegetation classification where applicable on Woodland and Grassland in accordance with AS3959:2018 Table 2.5, for FDI 80.

10.5. Slopes Assessment

The 'effective slope' influencing fire behaviour approaching the sites has been assessed in accordance with the methodology specified within AS3959. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 m transect measured outwards from the development boundary or the existing / proposed buildings.

Based on the assessment, the effective slopes relevant to the key project locations are demonstrated in Figures 21 and 22.

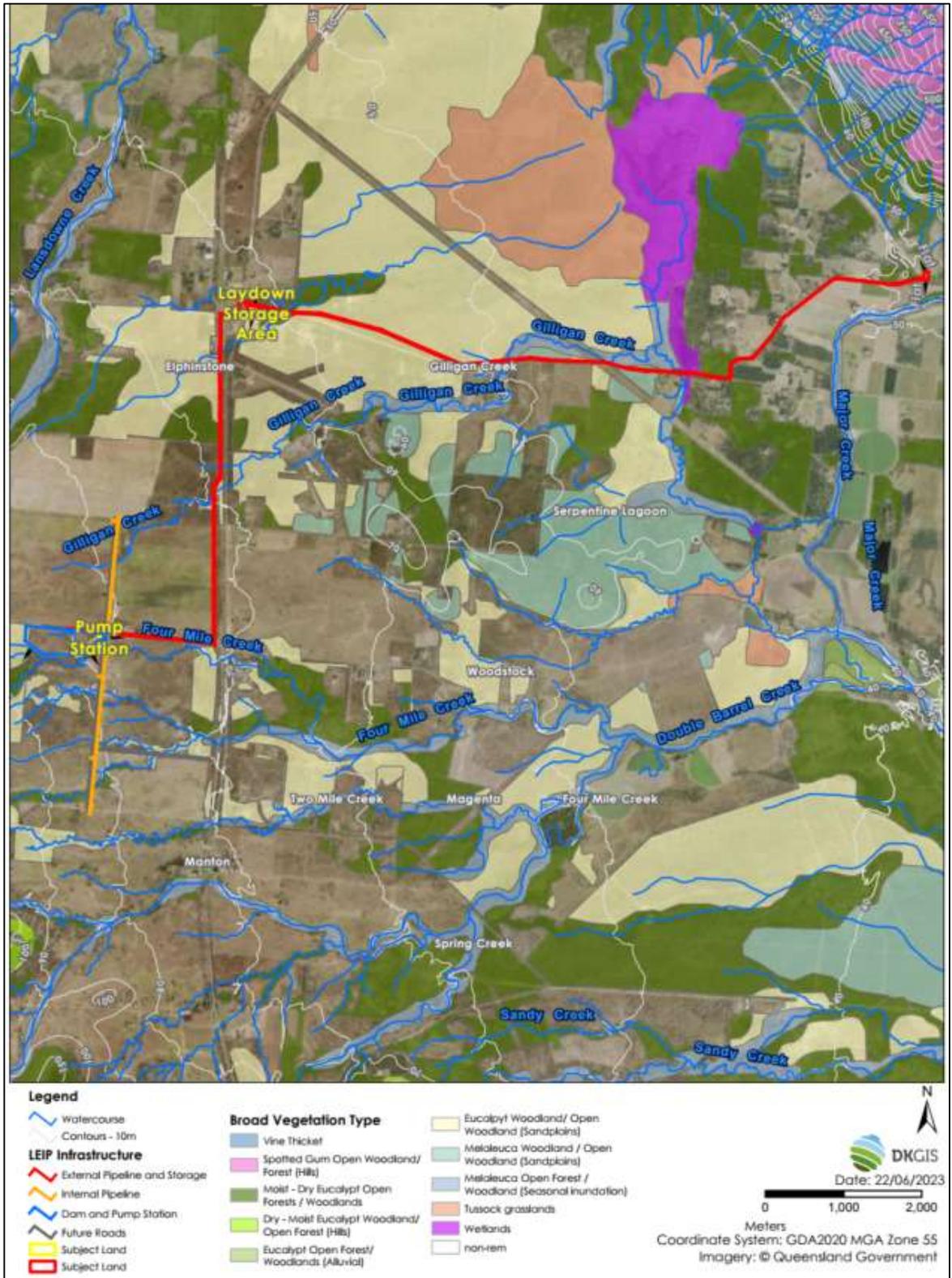


Figure 20: Vegetation and Slope Assessment Map – Site overview



Figure 21: Vegetation and Slope Assessment Map – Pump Station



Figure 22: Vegetation & Slope Assessment Map – Laydown Storage Area

11. Bushfire Attack Level Assessment

The Bushfire Attack Levels (BAL) is a means of measuring the ability of a building / structure to withstand attack from bushfire. The form of bushfire attack and the severity will vary according to the conditions (FDI, vegetation, slope and setback) on the site.

The BAL assesses the severity of a building or structure's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per square metre, which is the basis for establishing the requirements for construction to improve protection of a building from potential attack by a bushfire, as defined in AS3959:2018.

Due to the industrial nature of the development, which utilises specialist equipment and infrastructure, AS3959:2018 does not strictly apply to the project components. Instead, a risk based approach is required to be applied to the project components based on the tolerable radiant heat flux. As such, the project engineers have performed an independent assessment on bushfire heat tolerance (kW/m²) of the project components, which is included in Appendix 2.

The BAL setback is calculated based on the slope under the vegetation hazard, the vegetation type and the distance of the vegetation to the proposed structure. The BAL determinations have been performed utilising the following methodologies:

- Pump Station: Woodland & Grassland Vegetation – AS3959:2018 – Method 1, Table 2.5 (FDI 80), refer Figure 23; and
- Laydown Storage Area: Woodland Vegetation – AS3959:2018 – Method 1, Table 2.5 (FDI 80), refer Figure 24.

The BAL ratings are used as the basis for establishing the requirements for construction and Asset Protection Zones (APZ) to improve protection of a building/structure, or to determine the vulnerability of a building/structure to potential bushfire attack.

The radiant heat levels and corresponding BALs for the critical project infrastructure are provided in Figures 23 and 24.

11.1. Building Works Application (AS3959- 2018)

Building works should be undertaken in accordance with the Australian Standard for Construction of Buildings in Bushfire Prone Areas (AS3959) to enhance resilience and to reduce bushfire impact on the structures.

The Pump Station (Class 10 structure) should be designed and constructed in compliance with the *Australian Standard AS 3959-2018 Construction of buildings in bushfire-prone areas* (AS 3959:2018) and BAL-40, as per the project engineer's independent assessment on bushfire heat tolerance (kW/m²).

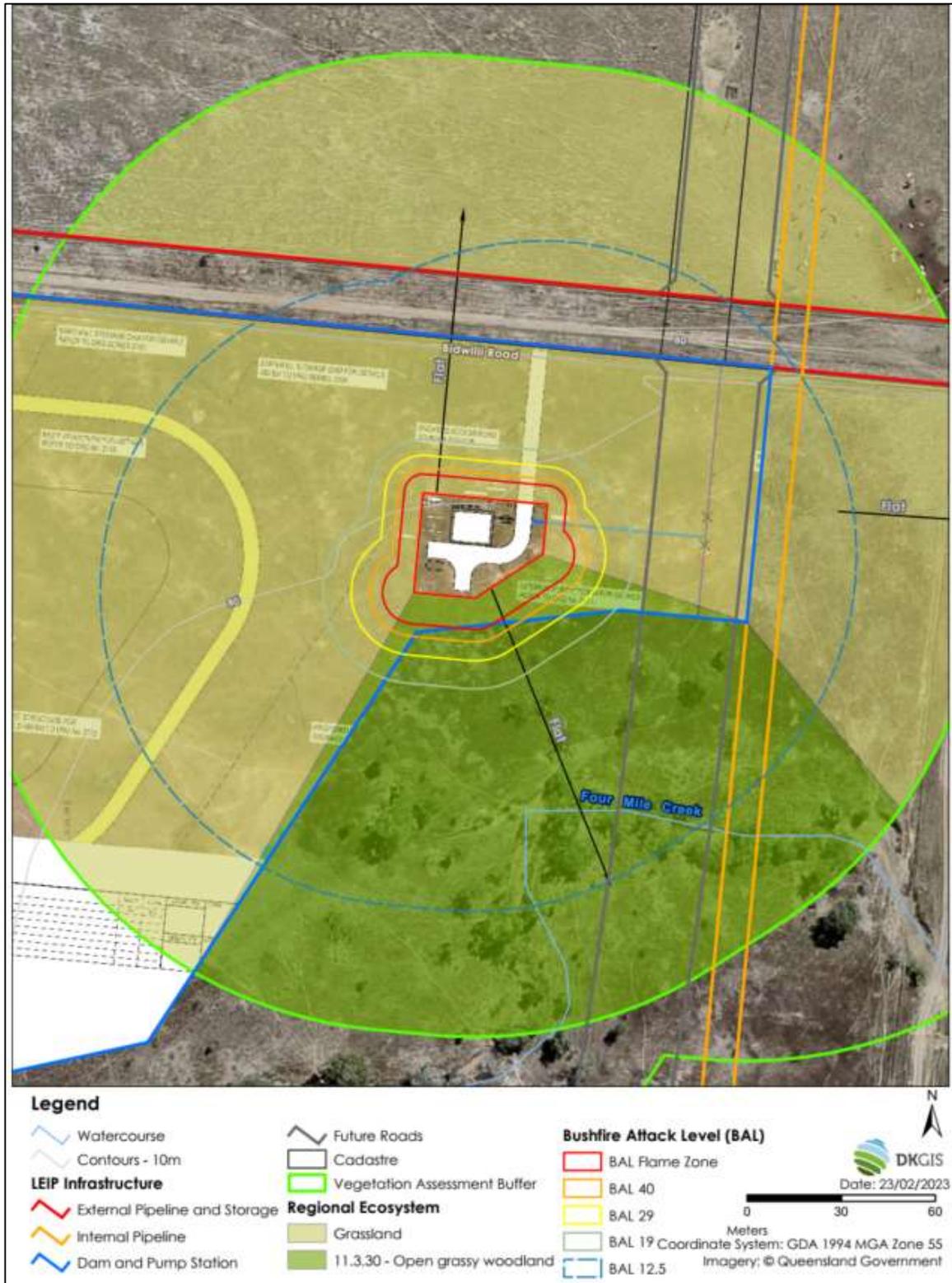


Figure 23: Bushfire Attack Level (BAL) Map – Pump Station



Figure 24: Bushfire Attack Level (BAL) Map – Laydown Storage Area

12. Asset Protection Zone (APZ)

A key part of managing bushfire risk is the provision of APZs, which is a fuel-reduced, physical separation between an asset and bushfire hazard vegetation, to achieve a prescribed radiant heat level on the relevant building / structure. The APZ also provides a suitable defensible space within which firefighting operations can be carried out. APZ maps have been provided in Figures 25 and 26, that show the minimum APZ required to achieve the project's engineering assessment of 40kW/m² (BAL-40) requirements.

The critical infrastructure associated with the project should be designed in such a way as to minimise the impact of bushfire on the infrastructure (ignition and propagation) and ensure that critical infrastructure does not cause a bushfire, or that capabilities are not compromised during bushfire emergencies. Bushfire protection measures should be commensurate with the bush fire risk and criticality of the infrastructure.

The construction of the buried pipeline requires the establishment of a 20-meter construction corridor. Blackash recommend that this 20-meter corridor be managed as an APZ for both the construction and operational phases of the Project. This would provide an area of reduced ignition risk for both construction and operational phases of the Project. The APZ would include the internal access road along the Project alignment and provide a suitable defensible space within which firefighting operations could be conducted.

The APZs as per Figures 25 and 26 and the 20-meter Project corridor would require the ongoing vegetation management in compliance with Section 12.1 below.

As the Site Laydown Area is temporary, for use only during the construction period, the APZ associated with the Site Laydown Area is only applicable for the period for which it is actively being utilised for Project works.

12.1. APZ – Vegetation Management

The APZ is required to be managed in compliance with the standards as set out below:

Trees

- Tree canopy cover should be less than 15% at maturity;
- Prune or remove trees so that there is not a continuous tree canopy leading from the hazard to the asset.

- Separate tree canopies by two to five metres.
- Trees at maturity should not overhang within two to five metres of a building / structure;
- Lower limbs should be removed up to a height of 2m above the ground;
- Preference should be given to smooth barked and evergreen trees.

Shrubs

- Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings/structures should be provided;
- Shrubs should not be located under trees;
- Shrubs should not form more than 10% ground cover; and
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- Grass should be kept mown (as a guide grass should be kept to no more than 100mm in height);
- Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter) and bark should be removed on a regular basis.
- Keeping areas beneath retained or planted trees and shrubs cleared of fuel. This may include vegetation management measures such as:
 - canopy lifting to reduce near-surface or ladder fuel loads and reduce flame heights;
 - clearing of understorey vegetation;
 - removal of accumulated litter and woody debris; and
 - removal of loose bark and dead limbs from standing trees.

As the APZ provides a fuel-reduced, physical separation between the new buildings/structures and bush fire hazards, it is a key element in the suite of bush fire measures and dictates the type of construction necessary to mitigate bushfire attack. In practical terms, the setback of each building/structure will form part of the APZ and will need to be conditioned to be maintained to the standards prescribed above.

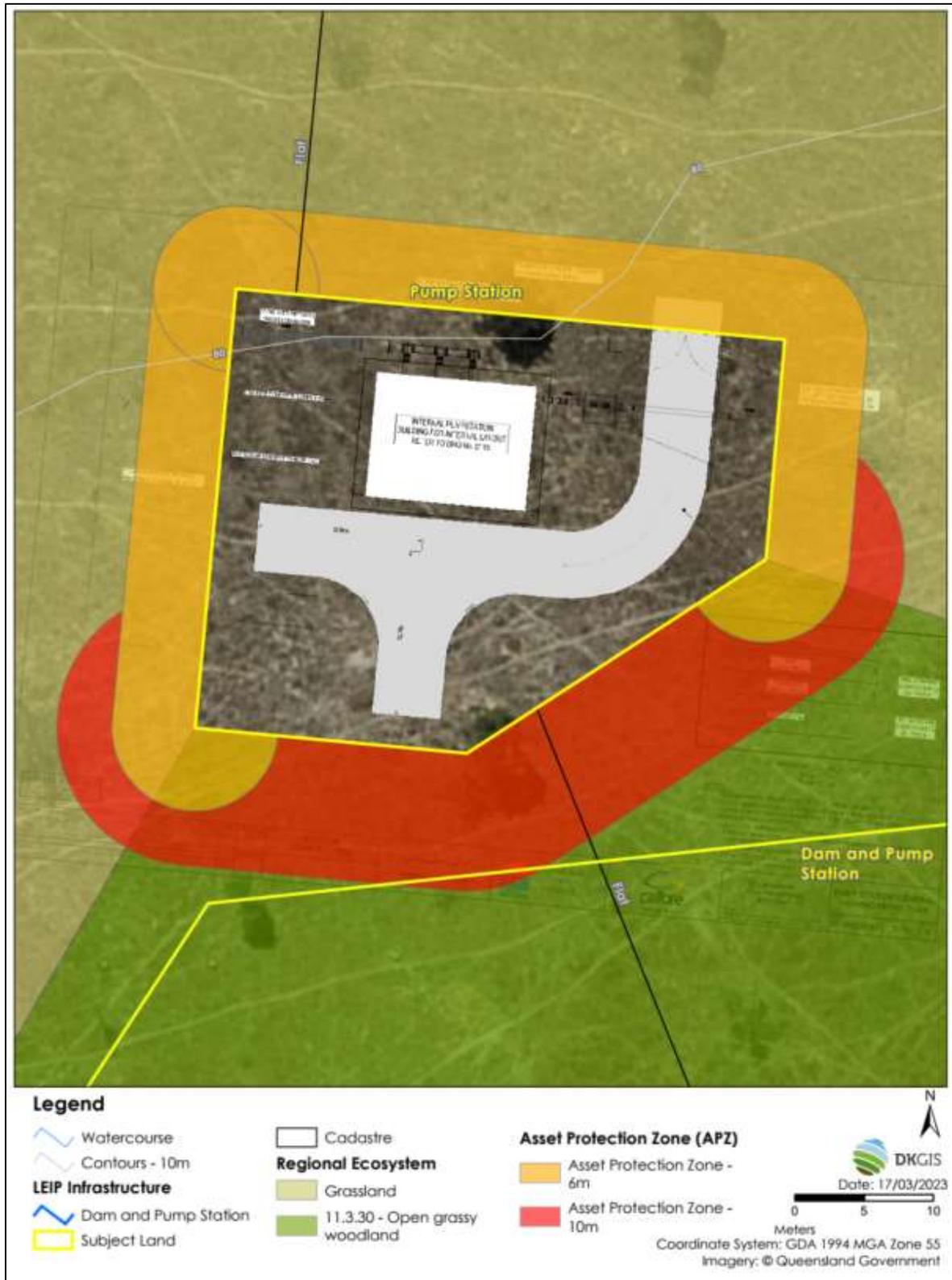


Figure 25: Minimum required APZ for BAL-40 (40kW/m²) – Pump Station



Figure 26: Minimum required APZ for BAL-40 (40kW/m²) – Laydown Storage Area

13. Access

The following access requirements are applicable to the development:

- The development is designed to allow for efficient emergency access to buildings/structures for firefighting appliances, including by avoiding long, narrow access arrangements.
- All new and upgraded roads, inclusive of internal access roads, are to be two-wheel drive, all-weather roads;
- Where kerb and guttering is provided on roads adjacent to hazardous vegetation, roll top kerbing should be used to the hazard side of the road;
- the capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges/ causeways are to clearly indicate load rating;
- There is suitable access for a Category 1 fire appliance to within 4m of any static water supply where no reticulated supply is available;
- Minimum 4m carriageway width for all access roads (Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed);
- Internal access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay;
- A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches;
- Provide suitable turning areas for a Category 1 fire appliances at static water supply locations;
- Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress;
- The minimum distance between inner and outer curves is 6m;
- The crossfall is not more than 10 degrees; and
- Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.

14. Water Supply

Blackash are of the understanding that the development will not be supplied with reticulated water supply either during construction or in the operational phase. The Storage Dam (~ 437ML capacity) can be utilised as a water source for firefighting purposes across the Project site, however Blackash recommend the installation of a 20,000 litre water tank at the storage tank site for times of drought and dedicated for firefighting purposes only.

In consideration of the Bushfire hazard overlay code AO4.1.1 and AO4.1.2, a 20,000 litre non-combustible water tank with suitable fire brigade fittings will be supplied at both the Pump Station and Laydown Storage Area that is dedicated for firefighting purposes only. This is to ensure adequate water supplies are available for people and firefighters to defend buildings from bushfires and to suppress other property fires across the Project site.

The on site static water supply is to incorporate safe and clear access for a Category 1 fire appliance (up to 23 tonnes) to within of 4 meters of the water tanks.

Water supply is required to be design and implemented in compliance with the following requirements:

Static Water supply – Construction and operational phases:

- A static water supply is provided where no reticulated water is available;
- In consideration of the Bushfire hazard overlay code AO4.1.1 and AO4.1.2, a 20,000 litre non-combustible water tank with suitable which has fire brigade fittings will be supplied at both the Pump Station and Laydown Storage Area that is dedicated for firefighting purposes only;
- All above-ground water service pipes external to the building/structure are metal, including any fittings and up to any taps;
- Any ball valve and pipes are adequate for water flow and are metal;
- Supply pipes from tank to ball valve have the same bore size to ensure flow volume;
- Underground tanks have an access hole of 200mm (minimum) to allow tankers to refill direct from the tank;
- A hardened ground surface for truck access is supplied within 4m;
- Above-ground tanks are non-combustible.;
- Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS3959:2018);
- Unobstructed access can be provided at all times;
- Underground tanks are clearly marked/signposted;

- Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; and
- Fire hose reels are constructed in accordance with AS/NZS 1221:1997 and installed in accordance with the relevant clauses of AS 2441:2005.

15. Gas and electrical supplies

Gas services are required to be design and implemented with consideration of the following:

- Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used;
- All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side;
- connections to and from gas cylinders are metal;
- If gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion;
- Polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used; and
- Above-ground gas service pipes external to the building are metal, including and up to any outlets.

Electrical services are required to be design and implemented with consideration of the following:

- Where practicable, electrical transmission lines are underground; and
- Where overhead, electrical transmission lines are proposed as follows:
 - Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and
 - No part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

16. Potential Bushfire Impact

The approach to the assessment of bushfire risk involved:

- an assessment of the risks to public safety, paying particular attention to bushfire risks, emergency egress and evacuation, and demonstrate consideration with the Bushfire hazard overlay code;
- determining the bushfire hazards and risk associated to the project from surrounding areas (i.e. bushfire impacting the project);
- consideration of construction and operational activities that may have the potential to cause risks from the project, staff and public (community) health and safety (i.e. the project starting bushfires);
- assessment to determine bushfire attack levels and the required asset protection zones (APZs) for construction and operation of key Project site; and
- identification of recommended bushfire mitigation measures for the construction and operation of the project.

16.1. Potential construction impacts

There are a range of activities with the potential to initiate bushfire during construction, such as:

- accidental ignitions (e.g. cigarettes);
- construction vehicles, plant and equipment;
- vegetation removal including mulching/mowing;
- hot works (e.g. welding and grinding);
- activities undertaken at the Laydown Storage Area compound; and
- arson.

During construction of the project, work practices such as complying with Total Fire Ban requirements would assist in minimising the risk posed by these ignition sources. Provision of managed areas in the form of APZs would limit the spread of fires started within the identified works areas. Detailed recommendations relating to construction management measures and relevant work practices have been provided. These construction management measures will form part of the Construction Environmental Management Plan (CEMP).

16.2. Potential operational impacts

The operation of the project has a similar risk profile to that of the construction phase with regard to potential to initiate bushfires , such as:

- accidental ignitions (e.g. cigarettes);
- construction vehicles, plant and equipment;
- vegetation removal including mulching/mowing;
- hot works (e.g. welding and grinding); and
- arson.

Strategies related to bushfire mitigation include:

- Identification of hazardous bushfire areas that the development traverses focusing on Bushfire Prone Areas;
- Asset condition monitoring (inspections) - strategy pre-summer inspections of above ground infrastructure locations;
- Vegetation management – within the nominated APZs (Figures 25 and 26) and inclusive of the 20-meter APZ within the Project corridor.
- Design and construction standards; and
- Fire start reporting and analysis.

17. Management Measures

Environmental management for the project would be carried out in accordance with an approved Construction Environmental Management Plan (CEMP). Hazards and risks would be managed in accordance with Project's Safety Management system, policies and guidelines. This would seek to avoid, to the greatest extent possible, risks to public safety.

A comprehensive *Bushfire Emergency Management and Evacuation Plan* would be prepared as part of the construction emergency response plan for the project, including:

- protocols for the relocation of workers to nominated safe refuge zones during a bushfire emergency, either within or remote to the work zone (Bushfire Emergency and Evacuation Plan);
- protocols for the management of bushfire risk and fuel management during construction. This would include the restriction and/or prevention of certain activities that present bushfire risks on days with a fire danger rating of equal to or greater than 'high', and as directed by relevant state authorities; and
- training to inform construction workers of bushfire risks and preventative actions, including risks associated with the operation (and maintenance) of vehicles, plant and equipment.

The CEMP would also include strategies and measures for:

- management of hazardous materials and dangerous goods; and
- management of other hazards and risks to the general public and the environment.

Detailed mitigation and management measures have been provided in Section 22.

18. Landscape Management

With consideration of AO9.1 of the Bushfire hazard overlay code, the 20m construction corridor is recommended to be managed as an APZ in compliance with section 12.1 of this report, for both the construction and operational phases of the project. This would provide a suitable APZ that would create an area of reduced ignition risk for the construction and operational works (maintenance), and provide a defensible space within which firefighting operations could be conducted.

The AZPs as stipulated in Figures 25 and 26 for the Pump Station and Laydown Storage Area will also require implementation in compliance with Section 12.1 of this report.

Any proposed fences and gates within the Project area should be made of either hardwood or non-combustible material. However, in circumstances where the fence is within 6m of a building/structure or in areas of BAL-29 or greater, they should be made of non-combustible material only.

19. Bushfire Risk Assessment – Construction & Operation

This section describes the bushfire risk assessment during construction and operation of the project. Where relevant, the discussion on the bushfire risk assessment has been separated into two parts (with subheadings) as follows:

- 1) Risk posed by bushfire to the project (ie. Where a fire originating from outside the project footprint threatens the Project; and
- 2) Risk posed by bushfire ignited by Project activities.

Where the risk posed by bushfire can be clearly articulated without the need for separate discussion, consolidated commentary has been provided.

19.1. Potential Risk Considerations

The landscape potential of fires impacting the site during construction and operation are significant. The broader landscape has significant potential to carry large scale and intense bushfires. Wind and topography of the land create the potential path that a fire would take. The topography of the land through which the project infrastructure is located is typically level or gently undulating within a predominantly open landscape. Fires which occur in this landscape have the potential to spread in the direction of the wind with the dominant fire spread likely from the north-west, west and south-west.

The surrounding area includes designated BFAs, with a history of large-scale bushfire within the bounds of the Project or proximity of the Project. Fires can approach any of the Project infrastructure from any aspect with potential for small fires and large fires impacting the site.

Design and construction standards assist with fire risk management by ensuring appropriate construction specifications are adopted. This builds resilience and reduces the amount of unplanned problems and therefore, fire start risk. This requires consideration during the design, procurement, construction, and commissioning phases.

The potential sources of ignition of bushfires resulting from the construction and operation of the project include:

- Accidental ignitions such as cigarettes;
- construction equipment including bulldozers, excavators and cranes;
- motor vehicles;
- vegetation removal including mulching/mowing;
- hot works such as welding and grinding;
- electrical faults in equipment;
- chemical fires;
- activities undertaken at the Laydown Storage Area compound; and
- arson.

19.2. Risk posed by bushfire for project work areas

19.2.1. Project Work Areas

Hot works undertaken within the construction work areas including equipment maintenance which includes welding and grinding and vegetation management such as mechanical slashing can produce sparks which have the capacity to spread for some distance on the wind, resulting in an extreme level of risk of ignition of cured (dry) vegetation. To reduce the level of risk, it is recommended that the 20-meter wide construction corridor and Figures 25 and 26, would be managed as an APZ in compliance with Section 12.1. Precaution would be used during all external hot works with shielding and a water supply (such as with an appropriately sized water fire extinguisher or fire fighting pumps) provided close to the works.

External cooking fires (such as BBQ), electrical faults and the inappropriate discarding of lit cigarettes can cause ignition of grassland within and external to the construction work areas. This risk can be managed in accordance with the Total Fire Ban requirements and a water supply (such as with an appropriately sized water fire extinguisher) provided. Fuel free areas (hard stand areas) within the 20-meter construction corridor would be provided that would not provide for ignition of materials.

APZs as per Figures 25 and 26 and to the 20-meter construction corridor are provided to mitigate the risk of fire spreading from these locations and fire impacting the surrounding landscape.

With the proposed protection measures in place, the potential bushfire risk to the proposed construction is considered to be low – moderate.

19.3. Construction activities within the project work areas

19.3.1. Risk posed by bushfire ignited by project activities

The use of motor vehicles can cause ignition of grass from hot engines and exhaust pipes. Heavy construction equipment used for vegetation removal including bulldozers, and excavators for excavating pads and drilling bore holes can create situations where these activities can give off sparks when steel blades encounter rock, resulting in a high level of risk of ignition of vegetation.

To reduce the level of risk, the use of this equipment in areas where rock is known to occur would be accompanied by a fire-fighting appliance such as a 'slip-on' fire-fighting unit or tanker trailers. This work would also need to include restriction and/or prevention of certain activities that present bushfire risks on days with a fire danger rating of equal to or greater than 'high' based on a risk assessment endorsed by an appropriately qualified person being completed.

Motor vehicle exhaust systems may ignite grassland vegetation through hot engines, exhaust and particle emission. Diesel powered trucks with pollution control devices in the exhaust system have the potential to emit burning diesel particles which ignite grassland vegetation and forest ground fuels, resulting in a high level of risk of ignition of vegetation.

These risks can be managed by utilising dedicated all-weather access roads, water fire extinguishers in vehicles and communications protocols for escalating fires.

The risk of fire starting and spreading following mitigation measures is considered low – moderate.

19.3.2. Risk posed by bushfire to the project personnel

A detailed *Bushfire Emergency Management and Evacuation Plan* would be developed and implemented for the construction areas that would focus on life safety and leaving isolated bushfire prone areas when the fire weather risk is too high (i.e. above high) or when uncontrolled fires are burning in the landscape that could impact construction areas. The risk to personnel in the construction corridor following mitigation measures is considered to be low – moderate.

19.4. External fires and arson

Significant potential exists for fires to start that are not associated with the project. These fires have potential to run into the construction area, isolating the construction crews and causing bushfire attack on vulnerable assets. During the bushfire danger period, this risk would be managed by a range of actions to monitor the weather and fire starts within proximity to the Project in line with the *Bushfire Emergency Management and Evacuation Plan*. Any fires that have potential to isolate or impact the site would trigger the *Bushfire Emergency Management and Evacuation Plan* for construction and or operation. This risk can be managed.

19.5. Emergency Protocols

The *Bushfire Emergency Management and Evacuation Plan* would outline actions to take if fires start on the project to notify emergency services.

20. Emergency egress and evacuation

There are no identified difficulties in accessing and suppressing the fires that could occur within the project area. The overall project area is characterised by gently undulating grasslands and some discrete areas of woodland vegetation. The areas surrounding the project are broken up by farmed areas, roads, easements and other small breaks providing a range of suppression options based on specific conditions during a bushfire.

Access to the project for safe firefighting operations within the APZs is provided. Water within key locations would be provided as part of the detailed design for construction and operation. The project has existing and new connections to the surrounding road network that service the region. This enables the effective distribution of traffic from the project to the wider road network. The *Bushfire Emergency Management and Evacuation Plan* would outline a series of trigger points for the construction and operational phase of the project to provide a system that does not expose personnel to unreasonable risks.

The national position of fire agencies is that *the safest action to protect life is for people to be away from the bushfire or threat of bushfire*². This is underpinned by comprehensive emergency management arrangements and operational fire management systems that focus on the provision of information, advice, and warnings to assist communities to make informed decisions prior to the impact of bushfire and if necessary be out of Bushfire Prone Areas well before the impact of fire.

Within the QLD planning framework, there is a hierarchy of controls in place to mitigate bushfire risk to communities. The Bushfire Protection Measures work in unison to enhance resilience by the provision of minimum standards for new development while reducing the vulnerability of negative impacts on occupants (including fire fighters) of these areas.

While appreciating these issues, the design team must provide compliant access within the sites that links into existing road infrastructure in a positive way. The road network is capable of sustaining traffic flows in an emergency.

The evacuation options that would be outlined in the *Bushfire Emergency Management and Evacuation Plan* provide flexibility and alternate routes to take if for some reason the primary route to a safer location is blocked.

² Australasian Fire and Emergency Services Authorities Council. (2019) *Bushfires and Community Safety Position* (AFAC Publication No. 2028)

21. Compliance Tables

21.1. Outcomes of the Bushfire hazard overlay code

Table 7: Compliance summary against the Outcomes of the bushfire hazard overlap code:

Objectives	Meets Criteria	Comment
Development is compatible with the nature of the bushfire hazard except where there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.	Yes	<ul style="list-style-type: none"> The study area is compatible with the proposed development. Suitable APZs have been provided to protect critical infrastructure and reduce the bushfire risk originating from the Project works.
Where development is not compatible with the nature of the bushfire hazard and there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.	Yes	<ul style="list-style-type: none"> The study area is compatible with the proposed development.
Wherever practicable, facilities with a role in emergency management and vulnerable community services are located and designed to function effectively during and immediately after bushfire hazard events.	Yes	<ul style="list-style-type: none"> This Bushfire management Plan includes consideration and recommendations to facilitate bushfire response. A <i>Bushfire Emergency Management and Evacuation Plan</i> will be prepared as part of the project.

21.2. Outcomes of the Bushfire hazard overlay code

Table 8: Compliance summary against the Outcomes Schedule 6.8 (SC6.8) Mitigating bushfire hazard planning scheme policy:

Objectives	Meets Criteria	Comment
Support the outcomes presented in the Bushfire hazard overlay code.	Yes	<ul style="list-style-type: none"> This Bushfire management Plan includes consideration and recommendations to support the Bushfire hazard overlay code.
Provide guidance and information relating to the preparation of a Bushfire hazard assessment, and where necessary a Bushfire management plan.	Yes	<ul style="list-style-type: none"> Bushfire management Plan prepared.

21.3. 8.2.2 Bushfire Hazard Overlay Code: Assessment Benchmarks

Table 9: Compliance summary against Accepted development subject to requirements and assessable development (Part):

Table 8.2.2.3 - Accepted development subject to requirements and assessable development (Part)				
Performance Outcomes		Acceptable Outcomes		Proposal Compliance Summary
<i>General — all development</i>				
PO1	Development maintains the safety of people and property.	-	No acceptable outcome is nominated.	<ul style="list-style-type: none"> • Bushfire management Plan prepared for the implementation of bushfire mitigation measures. • A comprehensive Bushfire Emergency Management and Evacuation Plan is to be prepared as part of the construction and operational emergency response plan for the project.
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	<p>The following uses are not located in a high bushfire hazard area:</p> <p>child care centre; or</p> <ol style="list-style-type: none"> a) detention facility; or b) educational establishment; or c) emergency services; or d) hospital; or e) industry activities involving manufacture or storage of hazardous materials in bulk; or f) multiple dwelling; or g) residential care facility; or h) retirement facility; or i) relocatable home park; or j) rooming accommodation; or k) shopping centre; or l) short-term accommodation; or m) telecommunications facility; or n) tourist park; or o) tourist attraction; or p) transport depot; or 	<p>With regard to AO2 item (q) utility installation, there is a section of the underground pipeline that runs through High Potential Bushfire Intensity Vegetation adjacent to Gilligan Creek in the northern portion of the project.</p> <ul style="list-style-type: none"> • Due to the pipeline being underground, the bushfire risk to the asset is eliminated. • There is potential for Butterfly valves to be installed in the areas of High Potential Bushfire Intensity Vegetation, project engineers have confirmed that these components can withstand bushfire radiant heat and do not require any mitigation measures (see Appendix 2).

			q) utility installation.	<ul style="list-style-type: none"> The 20-meter construction corridor is to be managed as an APZ for both the construction and operational phases of the Project.
PO3	Development mitigates the risk of bushfire hazard through the siting and design of the development.	-	No acceptable outcome is nominated.	<ul style="list-style-type: none"> APZs are to be provided as per Section 12. The 20-meter construction corridor is to be managed as an APZ for both the construction and operational phases of the Project.
PO4	Development provides for an adequate and accessible water supply for firefighting purposes.	AO4.1.1	The development is connected to a reticulated water supply where within a water supply area. OR;	Water supply as per Section 14 of this report.
		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.	Water supply as per Section 14 of this report.
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 .	<ul style="list-style-type: none"> Blackash have been informed that there are no hazardous manufacture or bulk storage applicable to the project. The pump station is likely to have some small fuel storage for a backup generator, which is not located within a high or medium bushfire hazard area.
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.	<ul style="list-style-type: none"> APZs are to be provided as per Section 12. The 20-meter construction corridor is to be managed as an APZ for both the construction and operational phases of the Project.

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.	Blackash have been informed that the development does not include the creation of any new lots.
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.	Access requirements as per Section 13 of this report.
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.	<ul style="list-style-type: none"> • APZs are to be provided as per Section 12. • The 20-meter construction corridor is to be managed as an APZ for both the construction and operational phases of the Project.
		AO9.2	The separation area mentioned in AO9.1 contains a fire access trail that: <ul style="list-style-type: none"> a) has a minimum cleared and formed width of 6m; b) has vehicular access at each end; c) provides passing bays and turning areas for fire-fighting appliances; and d) are either located on public land, or within an access easement that is granted in favour of council and QFRS. 	<ul style="list-style-type: none"> • Access requirements as per Section 13 of this report.
		AO9.3	Roads and trails: <ul style="list-style-type: none"> a) have a maximum gradient of 12.5%; and b) do not involve a cul-de-sac. 	<ul style="list-style-type: none"> • Access requirements as per Section 13 of this report.

22. Recommended Mitigation Measures

Table 10: Recommended mitigation measures:

Reference	Mitigation measures	Timing	Applicable location(s)
BF-01	<p>A construction emergency response plan would be developed to ensure evacuation and emergency response access is maintained during the construction and operation phases of the project. This would include a comprehensive bushfire emergency management and evacuation plan which would include details of emergency egress.</p> <p>The bushfire emergency management and evacuation plan would be prepared in accordance with the requirements of Australian Standard AS3745-2010 <i>Planning for Emergencies in facilities</i>.</p>	Pre-construction	All locations
BF-02	Access for Category 1 fire appliances would be provided in accordance with Section 13 of this BMP – for the full length of the Project alignment.	Pre-construction	All locations
BF-03	Hot work (activities involving high temperatures) and fire risk work (activities involving heat or with the potential to generate sparks) would be managed with measures including suspension	Construction and operations	All locations

Reference	Mitigation measures	Timing	Applicable location(s)
	of activities on days of elevated fire danger and establishment of Fuel free areas (hard stand areas).		
BF-04	Firefighting equipment would be maintained and made available for use during the construction and operational phases in accordance with Section 14 of this BMP.	Construction and operations	All locations
BF05	The project APZs would be managed during construction and operation in accordance with Section 12 and 12.1 of this BMP.	Construction and operations	All locations

23. Recommendations

The following recommendations have been made within this report to ensure the proposed development appropriately considers the Townsville City Plan Bushfire hazard overlay code:

Recommendation 1 – Asset Protection Zones (APZ) are implemented and managed in compliance with Sections 12 and 12.1 of this Bushfire management Plan.

Recommendation 2 – Access arrangements are implemented within the 20 meter Project corridor along the full project alignment, in compliance with Section 13 of this Bushfire management Plan.

Recommendation 3 – Water supply is to be designed and implemented in compliance with Section 14 of this Bushfire management Plan.

Recommendation 4 – Electricity and gas supplies are to be designed and implemented in consideration with Section 15 of this Bushfire management Plan.

Recommendation 5 – Any fencing and / or gates are to be constructed in compliance with Section 18 of this Bushfire management Plan.

Recommendation 6 – The Pump Station (Class 10 structure) should be designed and constructed in compliance with the *Australian Standard AS 3959-2018 Construction of buildings in bushfire-prone areas* (AS 3959:2018) and BAL-40, as per the project engineer's independent assessment on bushfire heat tolerance (kW/m²).

Recommendation 7 – Mitigation measures are implemented as per Table 10 of this Bushfire management Plan.

Recommendation 8 – A comprehensive Bushfire Emergency Management and Evacuation Plan would be prepared in accordance with the requirements of Australian Standard *AS3745-2010 Planning for Emergencies in facilities*.

24. Conclusion

The Lansdown Eco-Industrial Precinct – Enabling Infrastructure Project bushfire assessment has been undertaken in accordance with the framework and assessment methodology outlined by AS3959:2018 to determine the Bushfire Attack Level (BAL). AS3959:2018 identifies the methodology to determine BALs based on calculated radiant heat levels at a given site. This assessment is based on mapping of vegetation formations and slope assessment in accordance with AS3959:2018.

The study area includes designated bushfire prone areas under the Townsville City Plan, as such appropriate consideration has been made against the Bushfire hazard overlay code. This Bushfire Management Plan demonstrates that bushfire has been considered in the proposal and that the proposed development can meet the Townsville City Plan Section 8.2.2 Bushfire hazard overlay code.

In accordance with the bushfire mitigation measures contained in this Bushfire Management Plan and consideration of the site-specific bushfire risk assessment, it is our opinion that when combined, they will provide a reasonable and satisfactory level of bushfire protection to the subject development and Councils Planning Scheme requirements for new development in bushfire prone areas.

The APZ maps may need to be reviewed following determination of the site constraints (such as environmental, ecology, heritage, contamination etc). More detailed radiant heat modelling can also be undertaken following the constraints determination to potentially refine the BAL and reduce the required APZs as provided in this Bushfire Management Plan.



Scott Palin | Bushfire Specialist

Blackash Bushfire Consulting

B.EnvScMan | Grad. Cert. in Bushfire Protection (UWS)

Fire Protection Association of Australia BPAD Level 2 BPAD-60359



Lew Short | Principal

BlackAsh Bushfire Consulting

B.A., Grad. Dip. (Design for Bushfires), Grad. Cert. of Management (Macq), Grad. Cert. (Applied Management)

Fire Protection Association of Australia BPAD Level 3 BPD-PA 16373



Appendix 1: References

Standards Australia. 2009. *Construction of buildings in bushfire-prone areas*, AS 3959-2018. SAI Global, Sydney.

Townsville City Plan (Version 2022/02);

A new methodology for State-wide mapping of bushfire prone areas in Queensland.

<https://www.data.qld.gov.au/dataset/bushfire-hazard-area-bushfire-prone-area-inputs-queensland>.

[http://www.bonzle.com/weather of Woodstock QLD](http://www.bonzle.com/weather-of-Woodstock-QLD)

Appendix 2: Engineering BAL Assessment

From: Karan Sharma <Karan.Sharma@calibregroup.com>
Sent: Monday, 6 March 2023 10:19 AM
To: Mainey, Scott A. <maineysa@cdmsmith.com>; Emad Tadros <Emad.Tadros@calibregroup.com>
Cc: Lael Mayer <Lael.Mayer@rpsgroup.com.au>; Marchel Oegema <Marchel.Oegema@calibregroup.com>
Subject: RE: Mapping

Hi Scott,

Thanks for your email.

Based on our discussion last week and today on the bushfire assessment, I can recommend the following points for the raw water infrastructure deliverables:

- The internal pump station should have a clearance of BAL40.
 - However, please note that our design is currently on hold for the pump station, and in case there is a change in the BAL based on the new pump selection, we might have to revisit this clearance.
- The storage area should have a clearance of BAL40.
 - It is essential to note the storage yard isn't a permanent infrastructure compared to the internal pump station.
 - Moreover, the clearance inside the boundary of the storage area shouldn't be done in a single go. Instead, it should be carried out depending on the usage of the area, based on the contractor's and pip supplier's instructions.
- The external pipeline has some butterfly valves along its length, with an aluminium hatch and pit cover above the ground level.
 - Doesn't need a special BAL, but necessary to note that these structures will exist over the ground level.
- In the report, the Houghton pump station has been located incorrectly at the upstream connection point for the external pipeline. This should be removed and rectified.

Please let me know if you have any more questions. Feel free to contact Marchel or me for the same.

Kind Regards,

Karan



Karan Sharma
Engineer
D +61 452 521 194
E Karan.Sharma@calibregroup.com
Level 3, 545 Queen Street, Brisbane Qld 4000
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