Appendix I

Bushfire Assessment Report

New Grafton Correctional Centre SSDA 7413

INFRASTRUCTURE NSW

New Grafton Correctional Centre

Infrastructure NSW

Bushfire Assessment Working Paper

IA101200-BF-001 | Final

1 August 2016

New Grafton Correctional Centre

Project no:	IA101200
Document title:	Bushfire Assessment Working Paper
Document No.:	IA101200-BF-001
Revision:	Final Rev G
Date:	1 August 2016
Client name:	Infrastructure NSW
Client no:	NGCC EIS Support
Project manager:	Rachel Vazey
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File name:	J:\IE\Projects\04_Eastern\IA101200\02 Documents_Final Report_20160801\ToIssue\IA101200 Bushfire Assessment Report_Revised Final_20160801_ToIssue.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
Draft	19/02/2016	Draft for Project Manager review	C.Clifton	C.Thomson	R.Vazey
Draft	26/02/2016	Draft for client review	C.Clifton	R.Vazey	A.Spinks
Final	24/03/2016	Final submission	C.Clifton	C. Bennett	R.Vazey
Final revised	26 May 2016	Final submission	R.Vazey	C.Clifton	R.Vazey
Final revised V2	21 June 2016	Final submission	R.Vazey	C.Clifton	R.Vazey
Final revised VG	7 July 2016	Final submission	R.Vazey	R.Vazey	R.Vazey

Contents

Terms and acronyms used in this document

APZ	Asset protection zone(s).
BAL	Bushfire attack level (after AS 3959-2009 *Construction of buildings in bushfire prone areas*).
BCA	Building Council of Australia.
BFCC	Bush Fire Coordinating Committee of NSW.
BPL	Bushfire prone land.
BPM	Bushfire protection measures.
CVBFMC	Clarence Valley Bush Fire Management Committee.
DPE	Department of Planning and Environment.
EIS	Environmental Impact Assessment.
EP&A Act	*Environmental Planning and Assessment Act 1979.*
FDR	Fire danger rating.
INSW	Infrastructure NSW.
LGA	Local government area.
NGCC	New Grafton Correctional Centre.
PBP	Planning for bushfire protection (NSW RFS, 2006).
Project	Comprises the New Grafton Correctional Centre which will provide up to 1,700 new prison beds, within a maximum and minimum security correctional centre with relevant support services and facilities.
Project Site	Comprises of two properties Lot 26 DP 751376 and Lot 1 DP 1190399 and is located at 313 Avenue Road, Lavadia.
Proposal	Comprises the concept proposal and the Stage 1 works application.
RFS	NSW Rural Fire Service.
SEARs	Secretary's Environment Assessment Requirements.
SFPP	Special Fire Protection Purposes development.
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011.*
SSD	State Significant Development.

Executive Summary

Infrastructure NSW (INSW) on behalf of Corrective Services NSW (CSNSW), a division of the Department of Justice, is seeking approval under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the concept proposal and Stage 1 Development Application (Proposal) for the New Grafton Correctional Centre (the Project). The Project will be located on a 195 ha site (the Project Site), approximately 12.5 kilometres (km) south-east of Grafton in the Clarence Valley local government area. The concept proposal and the Stage 1 works application comprise the Proposal.

The Project will provide up to 1,700 new prison beds, within a maximum and minimum security correctional centre with relevant support services and facilities. The Project is treated as a Special Fire Protection Purposes (SFPP) development for the purpose of defining the bushfire protection measures. This working paper assesses bushfire hazards associated with the Project and describes applicable bushfire protection measures.

The Project is to be developed on a site which is not currently classified as bushfire prone land. Since the site and surrounding lands support connected areas of tall open forest, this classification was found to understate the site's bushfire risk. With its existing vegetation cover, much of the Project Site is considered to be in a high bushfire risk area (as defined by the NSW Rural Fire Service (RFS)) due to the presence of existing patches of native vegetation.

A suite of bushfire protection measures have been developed for the Project. They are predicated on the facility not being evacuated in case of an approaching bushfire and reflect the requirements of the NSW Rural Fire Service (RFS) publication *Planning for Bushfire Protection* (NSW RFS, 2006). Most measures cannot be fully described until the final built form and operation of the Project is finalised in future stages of the Project. Consistent with *Planning for Bushfire Protection*, the key protection measures include:

- Development of an asset protection zone (APZ) around the correctional centre and related facilities.
- Construction of an access road into the facility and access tracks or fire trails around the APZ and cleared perimeter.
- Provision of fire water supplies.
- Safe provision of other utilities.
- Emergency planning.
- Maintenance of fuel hazard in the APZ and throughout the Project Site, as well as of the access tracks.

Controls on site maintenance activities are required to minimise the risk of igniting a fire which could affect the facility and/or surrounding properties. A similar set of measures is likely to apply during the construction of the Project.

On the assumptions that native vegetation currently located within the Project's "cleared zone" (which relates to the cleared buffer surrounding the Project facilities that is required for security reasons) is entirely removed, there would be minimal additional vegetation removal required to implement the proposed bushfire protection measures. Environmental impacts associated with these measures would then be limited to the relatively minor impacts potentially associated with construction of the outer fire trail and fire break.

Bushfire protection measures to operate during the construction of the Project are not anticipated to have additional environmental impact to those required for its operation.

Recommendations arising from this assessment are that:

1) The lead contractor would develop a bushfire management plan to identify and manage bushfire-related risks to the Project and from its construction.
2) Key bushfire protection measures required for the operation of the Project should be confirmed and implemented during the construction of the built form in future stages of the project. These include:

construction of fire trails and fire breaks, provision of fire water supplies and the implementation of controls on hot works with potential to ignite fires.

3) The suitability of access to the Project site by NSW RFS fire appliances from the north and south/west should be assessed and upgrades provided if the roads are found to be inadequate for safe access.

4) Construction of the Project (subject of future stages) would incorporate bushfire protection measures which are consistent with the requirements of *Planning for Bushfire Protection* and the recommended measures described in Section 4 of this assessment.

5) Bushfire protection measures would be developed in conjunction with the NSW RFS.

This working paper has considered and fulfilled the Secretary's Environmental Assessment Requirements (SEARs) No 11 to provide a bushfire hazard report that addresses the requirements for Special Fire Protection Purposes development under *Planning for Bushfire Protection* (NSW Rural Fire Service, 2006).

1. Introduction

1.1 Background

Infrastructure NSW (INSW) on behalf of Corrective Services NSW, a division of the Department of Justice, is seeking approval under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A) for the concept proposal and Stage 1 works of the New Grafton Correctional Centre (NGCC) (the Proposal). The Proposal is the first stage of the delivery of the Project.

The Project satisfies the criteria of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* as the capital investment value of the correctional centre exceeds $30 million. As such, the Project is declared to be a State Significant Development (SSD) under Division 4.1, Part 4 of the EP&A Act and the Minister for Planning is the consent authority for the application. The Secretary's Environmental Assessment Requirements (SEARs) for the Proposal were issued by the Department of Planning and Environment (DPE) on 21 December 2015.

1.2 Locality

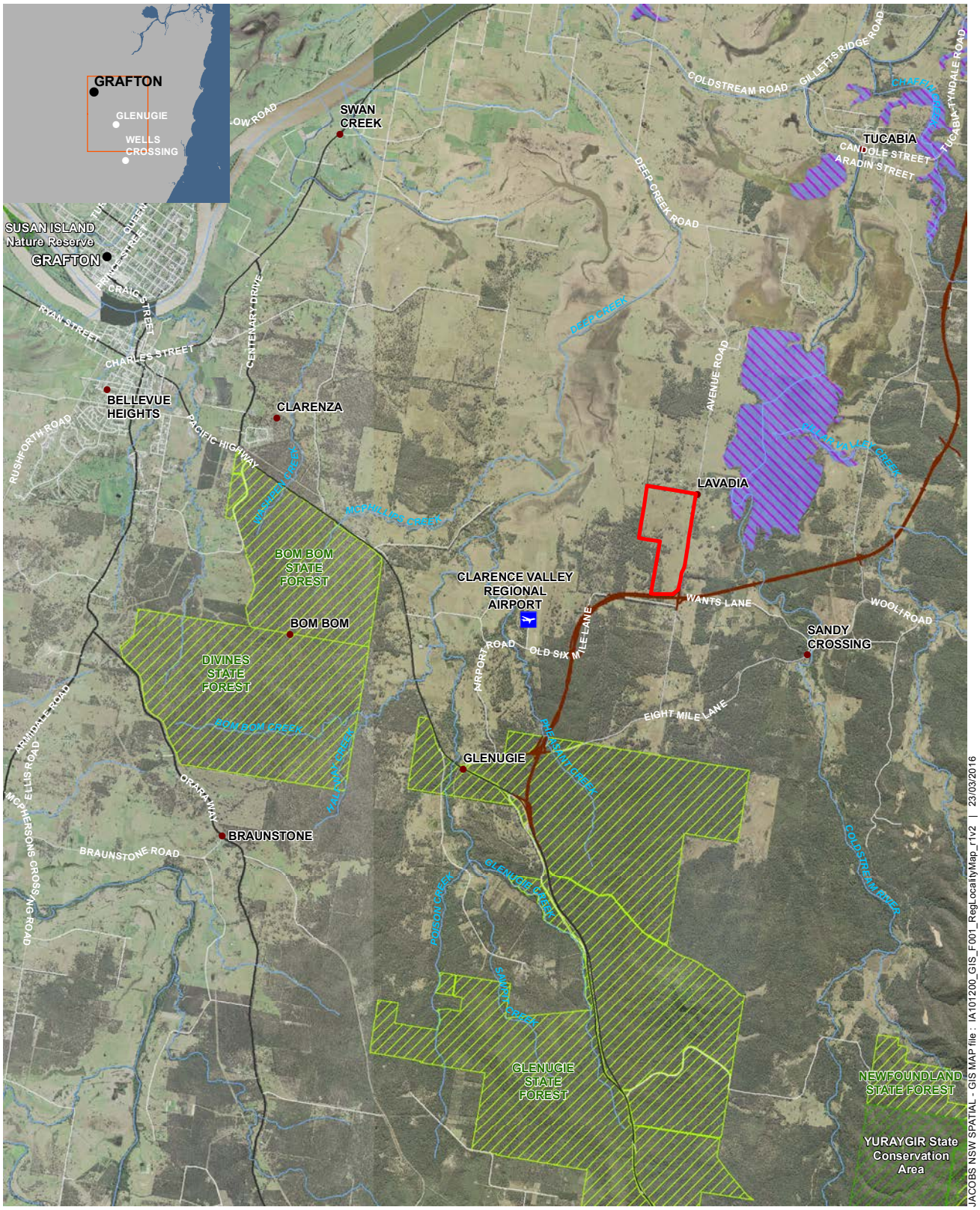
The Project is located approximately 12.5 kilometres (km) southeast of Grafton (refer to **Figure 1-1**), within the Clarence Valley local government area (LGA) at 313 Avenue Road, Lavadia (the Project Site). The Project Site is zoned RU2 – Rural Landscape under the *Clarence Valley Local Environmental Plan 2011.* Development for the purpose of a correctional centre is permissible with consent within the RU2 Rural Landscape zone.

The Project Site includes two properties comprised of Lot 26 DP 751376 and Lot 1 DP 1190399 and is 195 hectares (ha) in size (**Figure 1-2**). The site has historically been used for cattle grazing. In July 2015, development consent for a dwelling house in the southeast corner of Lot 1 DP 1190399 was granted by Council and construction of the house and adjacent shed is complete. The Project Site is bounded by Avenue Road (also recognised as Golden Mile Road) to the east, and Old Six Mile Lane to the south. Avenue Road connects to the Pacific Highway via Eight Mile Lane to the south and Old Six Mile Lane connects to the Pacific Highway to the west.

It is noted that the Grafton bypass portion of the upgraded Pacific Highway project (by Roads and Maritime Services) will, in addition to the reconfigured Old Six Mile Road, form the southern boundary of the site once completed in approximately 2019. As part of that project, Avenue Road will pass over the Pacific Highway and the intersection of Avenue Road and Old Six Mile Road will be upgraded to improve local access, without direct connection to the highway.

1.3 Project description

The New Grafton Correctional Centre (NGCC) requires a staged development application that sets out a concept proposal for a new correctional centre at Grafton that provides maximum and minimum security facilities and includes a total of 1,700 beds. The concept proposal includes a maximum built form height of 12 metres (approximately three storeys) with a gross floor area of approximately 100,000 square metres. The staged development application also seeks concurrent Stage 1 approval for site clearance and preparatory works. The concept proposal and the Stage 1 works application comprise the Proposal. **Table 1-1** provides a summary of the Proposal's key components and features.



Legend

- The Project
- Grafton Bypass (proposed)
- SEPP 14 Wetlands
- National Park Reserves
- State Forests

0 2 4 Km

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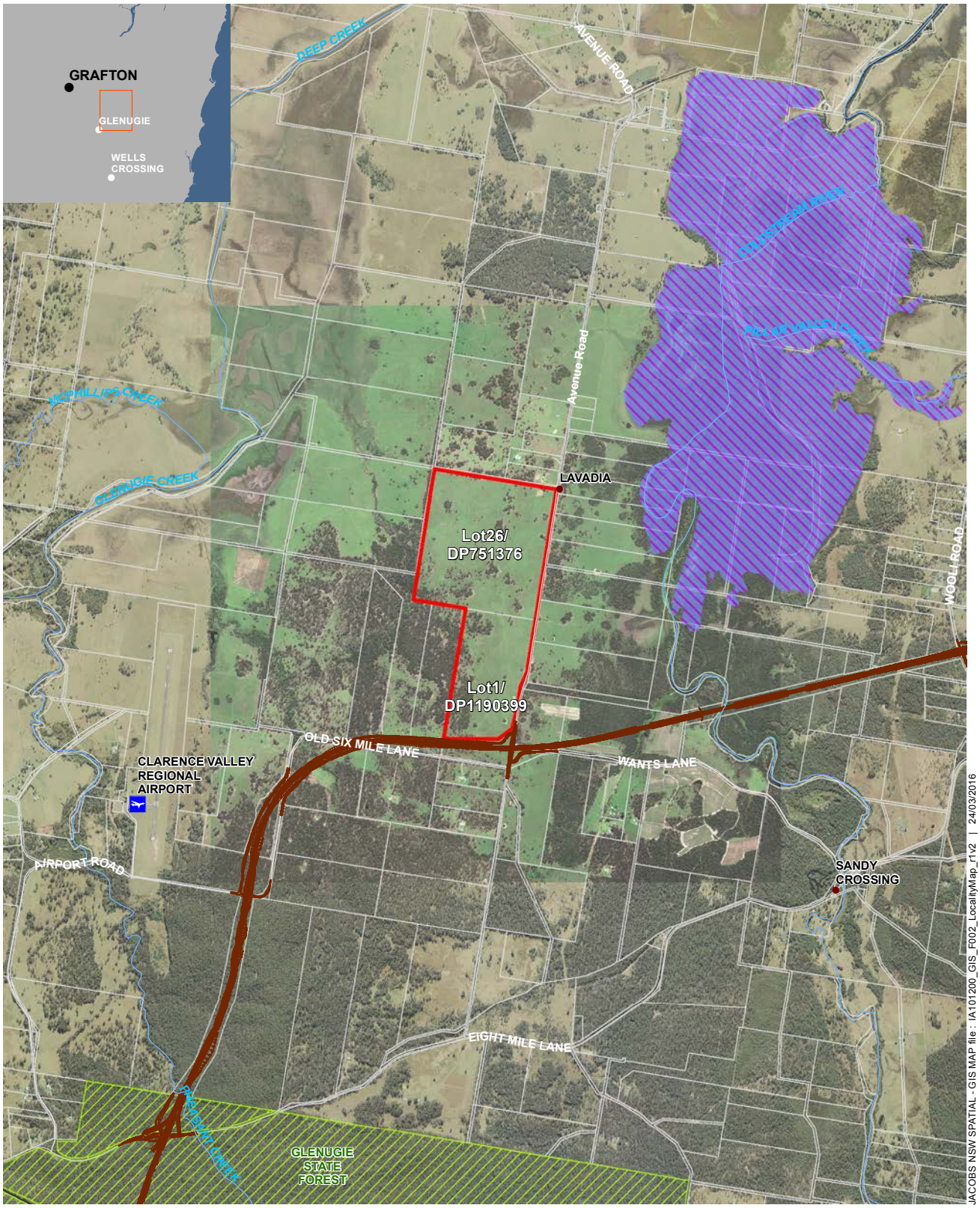
Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 1-1 | Regional Locality



Legend

- The Project
- Grafton Bypass (proposed)
- SEPP 14 Wetlands
- State Forests

0 1 2 Km

1:50,000 @ A4

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Data sources
Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 1-2 | The Project

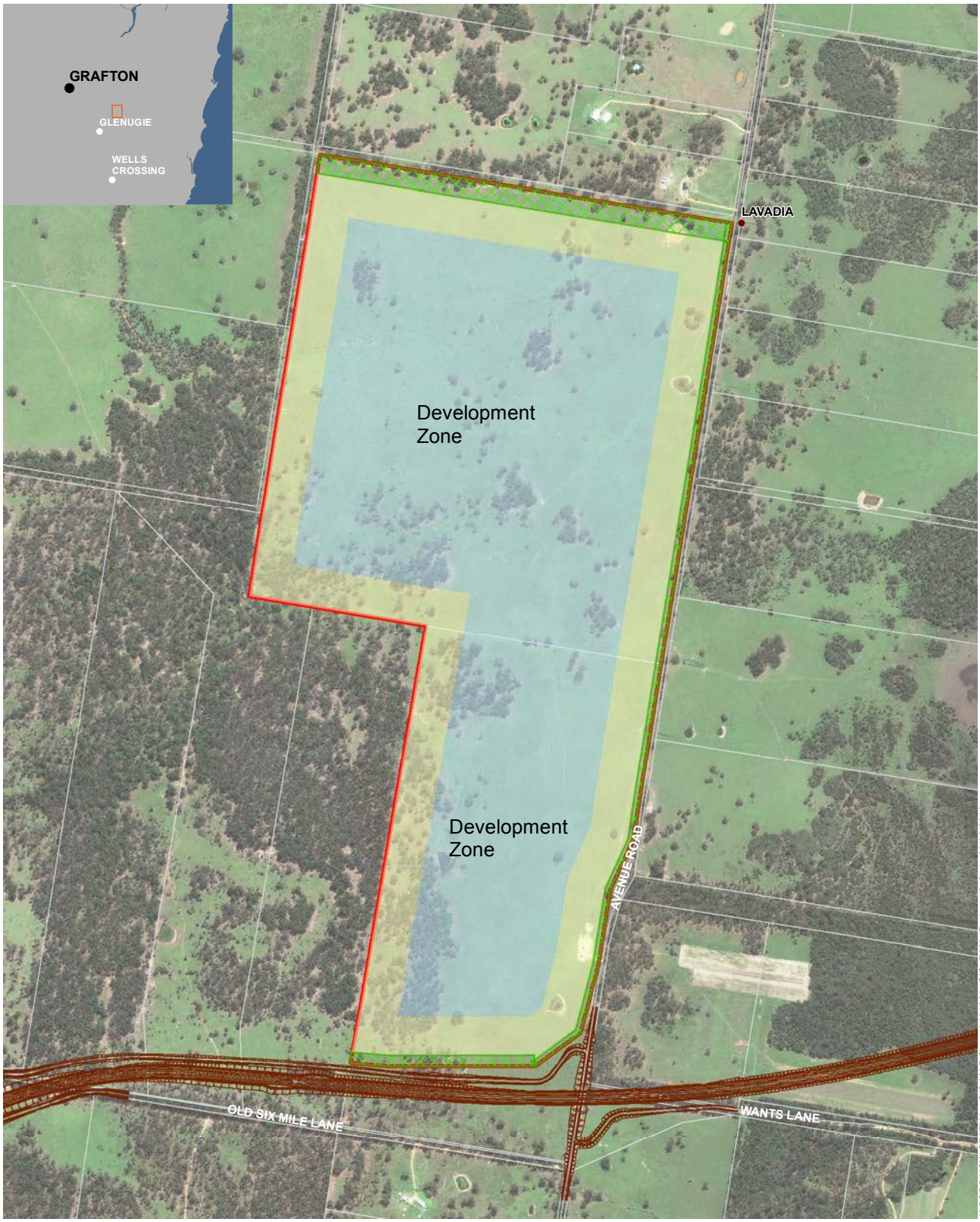
Table 1-1 Key Project Components

Stage	Description
Development summary	The staged SSD application seeks approval for: • A concept proposal for the New Grafton Correctional Centre. • First stage site clearance and preparatory works for the Project. • Together referred to as the Proposal.
Project Concept Proposal	The NGCC includes a maximum and minimum security correctional centre of 1,700 beds comprised of: • A maximum security section of 1,300 beds that will include: – 1,000 beds for male inmates. – 300 beds for female inmates. • A minimum security section that will include: – 400 bed residential accommodation for male inmates. The building envelope including the configuration, location and number of building structures required for the project would not be determined until the detailed design is complete as part of the Stage 2 works. Consequently, the stage 2 construction works for the Project could occur anywhere within the development zone shown in Figure 1-3. The total footprint around both the maximum and minimum correctional centres, including the carpark, is around 45 hectares. Features of the Project include the following: • The concept proposal includes a maximum built form height of 12 metres (approximately three storeys). • The gross floor area will be approximately 100,000 square metres. • A six metre high fence or wall will be constructed around the perimeter of the facility, with light and security camera poles up to 10 metres in height. • Store buildings, small ancillary facilities and a central energy plant will be located outside the perimeter walls / fences. • Internal access into and out of the correctional centre from Avenue Road will be provided. • Car parking for approximately 500 car spaces. • Other associated facilities include recreational oval, special accommodation units, health facilities, education and programs areas, administration, workshops, staff amenities, visitor facilities and utilities. • A 100-metre wide Asset Protection Zone (APZ) zone would be cleared around the correctional centre and associated facilities and car parking area in accordance with the *Rural Fires Act 1997* and requirements of the Planning for Bush Fire Protection (PBP; NSW Rural Fire Service [RFS], 2006). • A vegetation buffer outside the APZ would be provided along the northern, eastern and southern boundaries of the Project Site. The buffer would be 50 metres wide along the northern property boundary, 15 metres wide to the east along Avenue Road and 30 metres wide along the southern property boundary. • Fire access roads on the inside and the outside of the perimeter fence of the facility will be constructed to ensure safe operational access for emergency services personnel responding to a bushfire event. • Water, wastewater, power and communication utilities within the Project Site. • Landscaping of ground cover and /or shrubbery in areas to be defined.

Stage	Description
Stage 1 Site Clearance and Preparatory Works	Stage 1 (early works), includes preparatory work within the cadastral boundaries of Lot 26 DP 751376 and Lot 1 DP 1190399. This would involve: • Vegetation clearance and biodiversity management activities. • Construction of access roads including fire access roads to the extent required to conduct Stage 1 works. • Construction of auxiliary facilities such as construction compound, construction staff parking facilities and stockpiles sites. • Temporary provision of water, power and communication services within the site to the extent required to conduct Stage 1 works. • Demolition of the existing house and sheds. • Bulk excavation and site stabilisation works. • Landscaping.
Value	The capital investment value for the Project is in excess of $30 million.
Project Site	• Located at 313 Avenue Road, Lavadia. • Lot 26 DP 751376. • Lot 1 DP 1190399. • Project Site is195 hectares (ha) in size.

Future works regarding the design, construction and servicing of the Project will be based on the final design and layout of the facilities and will be the subject of future staged development application(s).

The construction activities associated with the Stage 1 site clearance and preparatory works is estimated to take six to 12 months and provide around 50 full time equivalent positions.



Legend

- The Project
- Landscaping zone
- Asset Protection Zone
- Development Zone
- Grafton Bypass (proposed)

0 250 500 Metres

1:15,000 @ A4

N

Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 1-3 | The Project

1.4 Project objectives

The objectives of the Project are to:

1) Be a safe and secure correctional centre.
2) Be a humane and ethically managed centre.
3) Help reduce the risk of re-offending through (among other things) preparing inmates for reintegration into the community on release from the CSNSW network.
4) Manage resources effectively and efficiently, enhancing value for money.
5) Utilise effective governance arrangements.
6) Produce strong economic and social benefits to the local Grafton region, the northern NSW region and the broader NSW community.
7) Be a valuable physical asset for the duration of the Operating Phase and beyond.
8) Be operated in such a way as to keep pace with best correctional practice over the term of its operational life.
9) Be operated so that it links with the broader management strategies and operational needs of the CSNSW network.

1.5 Report structure

This report is the *Bushfire Assessment Working Paper* and will support the EIS required for the Proposal under Division 4.1, Part 4 of the EP&A. The structure of the report is summarised in **Table 1-2**. SEARs relevant to this working paper and where they have been addressed in the report are summarised in **Table 1-3**.

Table 1-2 Report structure

Section reference	Section heading	Description
Executive summary	Executive summary	Concise summary of this technical paper and the key findings
1	Introduction • Background • Locality • Proposal description • Proposal objectives • Report structure	Overview of the Project and description of the structure of this technical report.
2	Assessment requirements: • Legislative requirements • Planning for bushfire protection • Bushfire prone land • Special fire protection purpose developments	Identifies the legislative and policy bases for this assessment and their key requirements.
3	Bushfire hazard assessment: • Overview • Site details • Bushfire prone land • Bushfire attack level exposure	The assessment of bushfire hazard for the site in terms of its bushfire prone land status and the anticipated level of bushfire risk and bushfire attack exposure.

Section reference	Section heading	Description
4	Bushfire protection measures during operation of the Project: • Overview • Key bushfire risk scenarios • Asset protection zones • Internal access roads • Utility provision • Emergency planning • Property maintenance • Potential environmental impacts of proposed bushfire protection measures • Managing bushfire ignitions on the Project site	Describes bushfire protection measures required for construction of the Project as a Special Fire Protection Purposes (SFPP) development. Additional property protection measures are described, as are potential environmental impacts of the protection measures. Bushfire protection measures for the operation of the Project are presented before those for construction. This reflects that operational requirements are specified by regulations and provide the framework for construction phase bushfire protection measures.
5	Bushfire protection measures during Project construction: • Overview • Key bushfire risk scenarios • Bushfire protection measures • Potential environmental impacts of bushfire protection measures	Describes bushfire protection measures required during construction phase of the Project and their potential environmental impacts.
6	Conclusions and recommendations: • Bushfire hazard assessment • Bushfire risk scenarios • Bushfire protection measures • Potential environmental impacts of bushfire protection measures • Recommendations	Concise statement about the key findings of this Bushfire Assessment Working Paper.

Table 1-3 Summary of bushfire hazard SEARs

SEARs	Cross reference
SEAR No 11 - Bushfire Address bushfire hazard and prepare a report that addresses the requirements for SFPP Development as detailed in Planning for Bush Fire Protection 2006 guidelines.	**Sections 3** and **4** address the requirements for SFPP developments under *Planning for Bushfire Protection* (NSW RFS, 2006).

2. Assessment requirements

2.1 Legislative requirements

The Project satisfies the criteria of Clause 16, Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011*, as it is for the purposes of a new correctional centre that has a capital investment value of more than $30 million. As such, the Project is declared to be State Significant Development (SDD) in accordance with Section 89C of the EP&A Act. The Minister for Planning, or his delegate, is the consent authority for the SSD under Section 89D of the EP&A Act.

INSW has requested that a staged development application be made for Project in accordance with Section 83B and Section 89D of the EP&A Act. The EIS and this working paper provide an assessment of the concept proposal and Stage 1 of the Project. Subsequent applications will be made for future stages of the Project.

Under Section 78(8A) of the EP&A Act, an EIS must accompany an application for SSD. The SEARs for the Project were issued by DPE on 21 December 2015 in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Planning consent for developments proposed to take place on bushfire prone land (BPL) in NSW is required under the EP&A Act and *Rural Fires Act 1997* to conform with specifications and guidance in *Planning for Bush Fire Protection* (PBP; NSW Rural Fire Service [RFS], 2006).

2.2 Planning for bushfire protection

PBP seeks to provide for human safety (including of fire responders) during bushfire events and minimise the effects of bushfires on property. It is underpinned by several principles:

- *Risk:* protection measures are proportional to the threat or risk bushfires pose to a development. Regardless of any setbacks or protection measures, the safety of a development in a bushfire-prone area cannot be entirely guaranteed.
- *Setbacks:* setbacks are used to provide a defendable space between a bushfire hazard and buildings and reduce the risk of direct flame contact and ember attack. Greater setback distances lower any subsequent requirement for bush fire protection construction standards.
- *Managing interfaces:* threats posed by bushfires are diminished by reducing the direct interface between developments and bushfire hazards.
- *Bush fire protection measures (BPM):* BPM assist building survival during bushfires and contribute to the safety of fire responders and members of the public located within a development on BPL. BPM must be contained within the overall development area. Only under exceptional circumstances may they be displaced onto adjoining lands.

Specific additional controls apply on BPL to residential, rural residential and Special Fire Protection Purposes developments (SFPP; see **Section 2.4**). These respond to their elevated level of risk. Several classes of BPM are defined (NSW RFS, 2006), namely:

- *Asset protection zones (APZ) and defendable space:* these are buffer zones between bushfire hazards and buildings. They are managed to reduce fuel hazard and consequent radiant heat, flame, ember and smoke exposure. APZ comprise inner and outer protection areas, with the former incorporating the defendable space.
- *Construction standards and design:* while these are not finalised at the development application stage, preliminary consideration of construction is required to ensure Building Council of Australia (BCA) standards are complied with and assumptions underpinning the APZ are appropriate.
- *Access standards:* new subdivisions and large SFPP must ensure that there is safe access, egress and defendable space for emergency services, as well as access for on-going management of APZ.

- *Water supply and utilities:* adequate fire water supplies are required. Gas and electricity services should not add to fire risk or impede fire responses.
- *Emergency management arrangements:* procedures for emergency responses and evacuation should be considered, particularly for SFPP.
- *Landscaping:* landscaping within the APZ must be consistent with provision of defendable space.

BPM are typically used in combinations which are relevant to the circumstances of the development site and the anticipated bushfire behaviour.

2.3 Bushfire prone land

The identification of BPL in NSW is the responsibility of local government area-based Bush Fire Management Committees (BFMC). BPL mapping is typically published by the respective local government and the maps and metadata are developed according to guidance provided by NSW RFS (2014).

BPL assessments are based on allocation of the vegetation present into one of three broad categories, as follows:

- *Category 1:* which includes areas of forest; woodland, heath, forested wetland and timber plantation, as well as remnant and short fire run vegetation within 30 metres (m) of each other where the combined area is greater than 2.5 ha.
- *Category 2:* which includes grasslands, freshwater wetlands, semi-arid woodlands, arid shrub lands and rainforests, as well as remnant vegetation and short fire run vegetation with greater than 100 m lateral separation from category 1 vegetation and 30 m from other category 2 vegetation.
- *Excluded vegetation:* small patches or strips of remnant vegetation, managed agricultural and non-agricultural grasslands, agricultural cropland, gardens and mangroves are not mapped as bushfire prone.

BPL is defined as land with category 1 or 2 vegetation and land within 100 m and 30 m , respectively, of either class of vegetation.

2.4 Special Fire Protection Purposes developments

SFPP developments are a special case, with residents having greater vulnerability due, for example, to their lower capacity to evaluate bushfire risk, poorer mobility and/or the greater logistical challenges in evacuation or providing alternative accommodation. Examples of such developments include: schools; child care facilities; hospitals, motels; housing for older or disabled people; and retirement facilities. Categories are defined in the *Rural Fires Act (1997)* and the associated *Rural Fire Regulations (2013).*

In formulating BPM for SFPP developments, NSW RFS (2006) indicate that it is necessary to provide for:

- *Special characteristics and needs of occupants:* occupants of SFPP developments may not be able to assist in property protection following the passage of the fire front and may be more vulnerable to the effects of smoke or heat while being evacuated.
- *Safe emergency evacuation procedures:* which require greater separation from bushfire threats to avoid prolonged exposure of emergency services personnel through evacuation.

Correctional facilities are not specifically listed as a type of SFPP development, although they and their occupants potentially share many of the attributes of such developments. The SEARs for the Project specify that must be considered as an SFPP development (refer to **Table 2-1**).

3. Bushfire hazard assessment

3.1 Overview

This assessment is focused on bushfire hazards and their management arising from the construction and operation of the on-site infrastructure within the prescribed Project Site. It considers the construction and operation of the Project within the Development Zone as discussed in **Chapter** 1 and shown in **Figure 1-3**.

The key assumptions about the construction and operation of the Project for the purposes of this bushfire hazard assessment is that all woody vegetation would be removed from within the defined "cleared zone" around the correctional centre and support service areas. This includes existing vegetation within the Development Zone and the APZ identified in **Figure 1-3**.

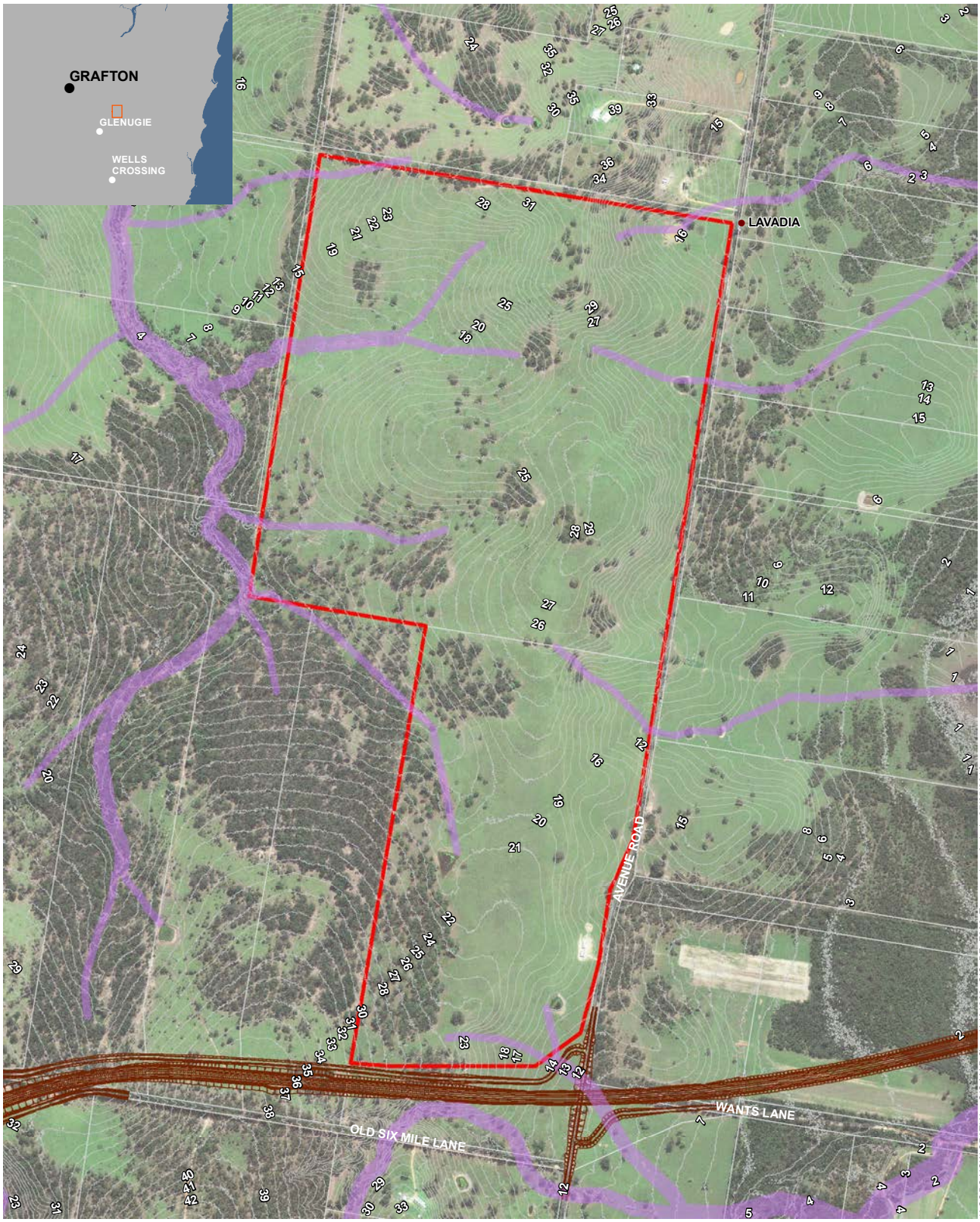
3.2 Site details

The Project is proposed to be developed on two adjoining properties, located south-east of Grafton. These comprise Lot 26 DP 751376 and Lot 1 DP 1190399 (**Figure 1-2**). The site's total area is 195 ha. It currently supports patches of remnant native vegetation of various sizes, as well as individual and small clumps of native trees. Pasture grasses dominate the cleared sections of the property and form the main understorey component in remnant vegetation patches (e.g. **Figure 3-1**).

Native vegetation on the Project Site is described in detail in the *Biodiversity Assessment Report*. Retained native vegetation on the Project Site and in the immediate areas around it mainly comprises tall open forest of various eucalypt species, sometimes in association with *Allocasuarina littoralis*. The main eucalypt species present are Pink Bloodwood (*Corymbia intermedia)*, Grey Gum (*Eucalyptus punctat*a, Spotted Gum (*C.maculata*) and Grey Ironbark (*E.paniculata*). Much of the native vegetation on the western side of the Project site is contiguous with larger patches on the adjoining properties.

Figure 3-1 Remnant native vegetation patch on Project Site

The properties on which the Project is proposed to be developed are located on a low, north-south trending ridge. Elevations range between about 10 and 35 m AHD. Slopes range up to about 10%, with the steepest areas located in the north and east (refer to **Figure 3-2**). The site has multiple aspects, but is generally west or east facing either side of the ridge.



Legend

- The Project
- Grafton Bypass (proposed)
- 1 m contours
- Drainage lines and riparian zones

0 250 500 Metres

1:15,000 @ A4

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Figure 3-2 | Topography and drainage features

Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

3.3 Bushfire prone land and bushfire risk assessment

Mapping published by Clarence Valley Council (refer to **Figure 3-3**) did not identify the Project Site as being bushfire prone. The nearest areas of defined BPL are located about 1 km to the east of the Project Site. However a large patch of native vegetation exists, both within and adjacent to the Project Site, and it was identified that an assessment of the bushfire risk for the Project Site during construction of the Proposal and operation of the Project was required to be undertaken. Procedures described in the relevant NSW RFS guidance (NSW RFS, 2014) were consequently used to determine the bush fire risk within the Project Site.

The bushfire risk assessment identified large patches of native vegetation present on the Project Site and in its immediate vicinity that conformed with the definition of Category 1 vegetation according to NSW RFS (2014); refer to **Section 2.3.** On the basis of their structure and patch size and for the purposes of this assessment these patches of vegetation have been identified as areas of high bushfire risk to the Project Site (refer to **Figure 3-4**). Small patches of native vegetation and scattered trees are typically too far removed from Category 1 patches to be defined as Category 2 vegetation according to NSW RFS (2014) refer to **Section 2.3**. Since the open areas have historically been managed pastures, they are considered to be *excluded vegetation* (under NSW RFS, 2014 guidance) and are not considered to be a bushfire risk.

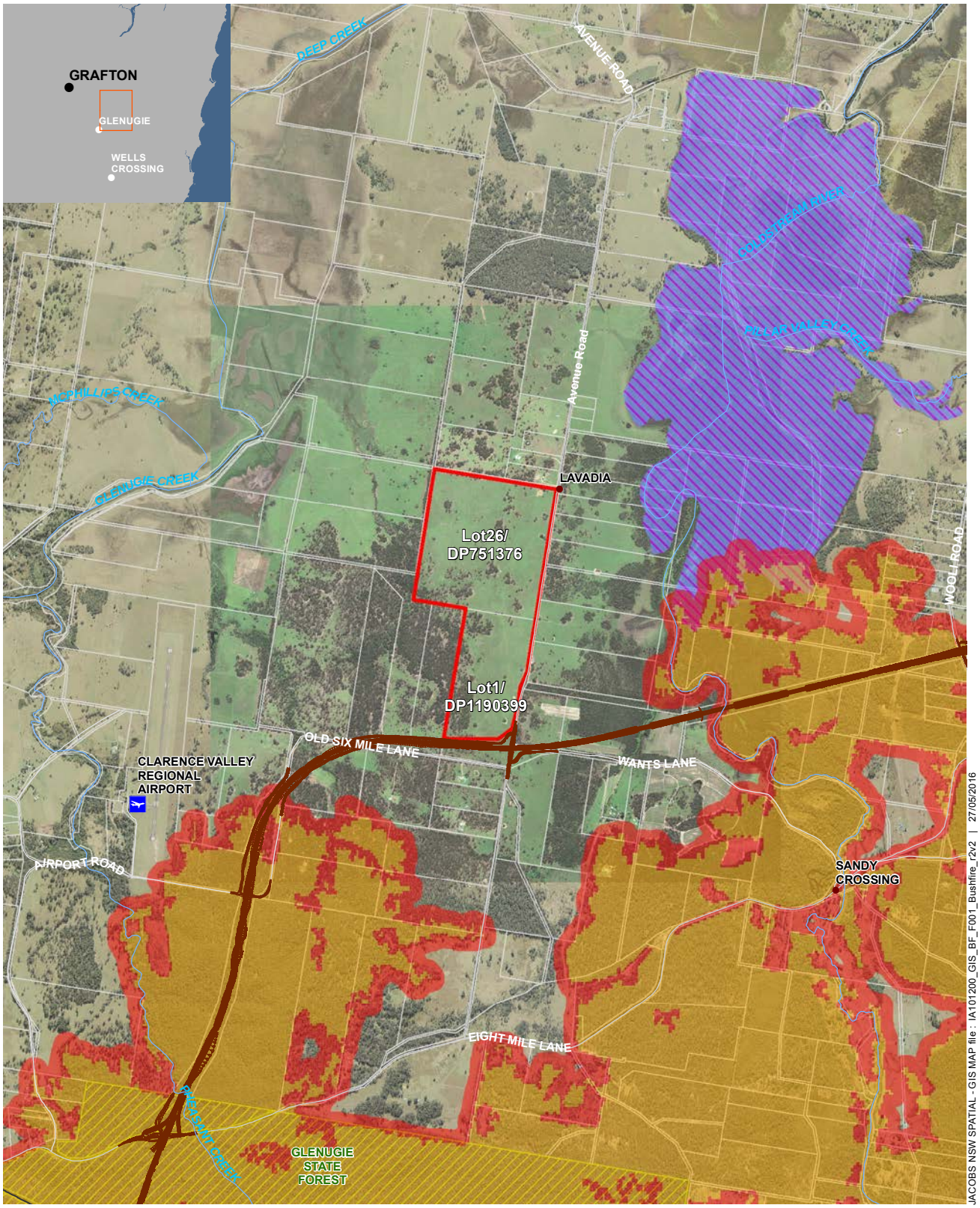
On this basis, sections of the Project Site as identified in **Figure 3-4**, is considered to be located on areas that have a high bush fire risk due to the existence of native vegetation.

If the cleared APZ around the minimum and maximum security correctional centres is created, the Proposal would be sufficiently removed from patches of Category 1 vegetation that the centres would not actually be located on land with a high bushfire risk (refer to **Figure 3-4**).

3.4 Bushfire attack level exposure

Residential buildings located on BPL are required to conform to AS 3959-2009, *Construction of buildings in bushfire prone areas* (Standards Australia, 2009). AS 3959-2009 requires that structures which may be exposed to flame, heat or ember attack incorporate appropriate protective design measures. These measures are proportional to the level of radiant heat exposure, which is defined by the separation between the structure and bushfire prone vegetation / high bushfire risk vegetation, the nature of the vegetation, the slope of the land on which the vegetation is located and the likely severity of fire weather conditions. No specific design measures are required when the vegetation is located more than 100 m from the structure. In such cases, the bushfire attack level (BAL) is rated as low.

With implementation of the cleared zone, the Project has an anticipated BAL exposure of BAL-low.



Legend

- The Project
- Grafton Bypass (proposed)
- SEPP 14 Wetlands
- State Forests

Bushfire prone land

- Vegetation buffer - 100 m & 30 m
- Vegetation Category 1

0 1 2 Km

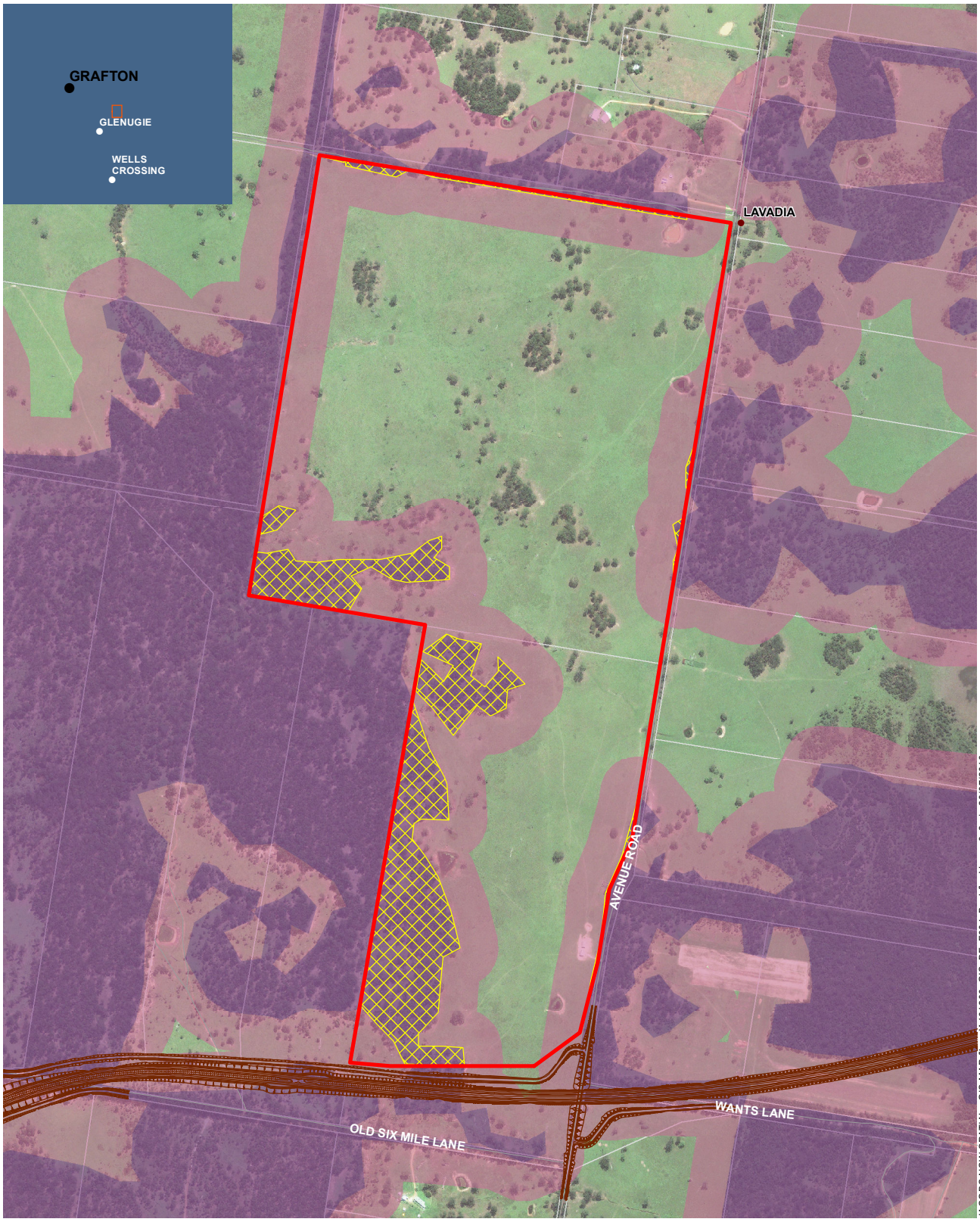
1:50,000 @ A4

N

Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)
Clarence Valley Council 2016

Figure 3-3 | Bushfire prone land



Legend

- The Project
- Grafton Bypass (proposed)

Bushfire risk areas

- High bushfire risk area
- 100m buffer on the high bushfire risk area
- Project Site bushfire risk areas

0 250 500 Metres

1:15,000 @ A4

N

Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 3-3 | Bushfire risk hazard map

4. Bushfire protection measures during operation of the Project

4.1 Overview

The Project is to be considered as a SFPP development, in part because it shares several of the characteristics of this type of development which contribute to their vulnerability and/or that of their occupants to bushfires. BPM for the Project must therefore follow those described for SFPP developments in *Planning for bushfire protection* (NSW RFS, 2006). There are several main forms of BPM, each of which has potential application for the Project. These are:

- *APZ:* which provide a buffer zone between a bush fire hazard and buildings. APZ are managed to minimise fuel loads and reduce potential radiant heat levels, flame, ember and smoke attack. They provide adequate defendable space for firefighters and other emergency services personnel.
- *Internal access roads:* which are typically intended to provide safe operational access for emergency services personnel to suppress a bushfire and for residents to access or move away from an area.
- *Utility provision:* adequate water is required for building protection during and after the passage of a fire front. Electricity and any gas services should be located to avoid exacerbating the risk of fire to the buildings.
- *Emergency and evacuation planning:* evacuation of future occupants of the Project is unlikely and therefore suitable emergency management arrangements must be devised.

None of the BPM can be definitively specified in this working paper as the final built form and design of the Project has not been finalised. However, recommended measures for consideration through the reference and detailed design process have been provided.

4.2 Key bushfire risk scenarios

The Clarence Valley LGA experiences a warm temperate climate (Clarence Valley Bush Fire Management Committee [CVBFMC], 2008). Average temperatures range between 19 and 30°C in January and 7 and 20°C in July. Monthly average rainfall ranges from about 50 millimetres (mm) between July and October to over 100 mm between December and March. Annual rainfall averages 1000 mm, but is highly variable between years[1].

The bushfire season in the Clarence Valley generally commences in early September and finishes in late February/early March. The bushfire danger period has been known to commence as early as mid-July and finish as late as mid-April the following year (CVBFMC, 2008). Bushfire seasons of this length are associated with extended periods of low rainfall, such as may occur during El Niño climate events. While winds in coastal areas are predominantly from the north-east to south, particularly in the afternoon, the most dangerous fire weather is associated with strong, warm, dry westerly winds during spring (CVBFMC, 2008).

Given the climate of the Grafton area and location of the Project in relation to large patches of native vegetation in which bushfires may develop, there are considered to be two main bushfire risk scenarios:

- *Scenario 1:* fire approaching the Project through native vegetation and pasture lands, under the influence of strong, dry, warm westerly winds. Such conditions would elevate fire danger and potentially contribute to dangerous and unpredictable fire behaviour. In such a scenario, a relatively intense bushfire could approach the NGCC quite rapidly and burn in bushland to the edge of the Project's allotments. Such a fire could cut access to the Project site from the south and west.
- *Scenario 2:* fire approaching the Project through pasturelands and/or native vegetation under the influence of strong, but mild and relatively humid winds from the south to north-east. Milder conditions would reduce the intensity and rate of spread of such a fire relative to one envisaged under the first scenario. Such a fire

[1] Based on data for Bureau of Meteorology station 058077, Grafton Research Station for 1917-2016.

may also cut access to the Project site from the south and west. Once constructed, the upgraded Pacific Highway will reduce the exposure of the Project area from the south and south-east.

The BPM proposed in the following sections account for the risks posed by these two scenarios, particularly from the first and more hazardous of the two.

4.3 Asset protection zones

APZ provide a low fuel hazard buffer between buildings and a bushfire hazard and create a defendable space to manage the flame, radiant heat and ember exposure of the building, emergency service personnel and occupants who remain in place or are evacuated. The required width of an APZ is determined from consideration of several factors, including:

- *Type of development*: SFPP developments require greater APZ widths than other types of development due to the greater vulnerability of occupants.
- *Type of vegetation:* tall open forests of the type present within and near the Project site pose the greatest bushfire risk and require the widest APZ of any of the vegetation types considered by PBP.
- *Slope:* under the higher risk bushfire scenario and potential Project footprint, high bushfire risk vegetation is located downslope of the Project Site. This means that fires will burn upslope towards them, which will increase the intensity and rate of spread.
- *Prevailing fire weather conditions:* the expected maximum fire danger index for Clarence Valley LGA (Far North NSW) is 80.

Based on the characteristics of the Project Site, the APZ must be at least 70 m wide, with at least 50 m of readily defendable inner protection area. If no provision is made for ember protection in the buildings' final design and construction, the APZ and its inner protection area must be at least 100 m wide.

Development of a cleared zone around the proposed facilities allows for the creation of an at least 100 m wide APZ around the outer walls of the correctional centres. As the exact location of the Project will be determined in the Stage 2 DA, a 100 m buffer has been included around the development zone for the facility (refer to **Figure 1-3**).

Grass growing in the cleared space within the APZ and any firebreaks should be maintained intensively, particularly at any stage when the grasses are cured and more flammable. The maximum recommended height is 10 centimetres (cm) at any time and 5 cm when cured. Any woody vegetation regrowth within this area should be removed and no landscaping or other re-vegetation works should be carried out.

4.4 Internal access roads

Internal roads are required for the Project to ensure safe operational access for emergency services personnel responding to a bushfire event. Access is required both into and around the property.

Access into the Project Site

There is a single proposed access point to the Project, which is the subject of this assessment. It enters the Project Site from Avenue (or Golden Mile) Road. Avenue Road connects to the Pacific Highway via Eight Mile Lane to the south and Old Six Mile Lane connects to the Pacific Highway to the west. If a fire were to approach the Project Site from bushland to the south or west, emergency services may need to access the Project Site from the north, via Avenue and Deep Creek Roads.

Old Six Mile Lane will be upgraded and relocated as part of the upgrade of the Pacific Highway and will form the southern boundary of this site once completed in approximately 2019. As part of that project, Avenue Road will pass over the Pacific Highway and the intersection of Avenue Road and Old Six Mile Road will be upgraded to improve local access, without direct connection to the highway.

The capacity of both northerly and southerly/westerly access routes to safely provide access to the Project Site for up to Category 1 fire appliances should be assessed in future stages of the Project. If access from either direction is deficient, upgrading of either or both access routes should be considered and undertaken if necessary. Proclaimed, but poorly-developed paper roads run along the northern and western boundaries of the northern allotment and are used to access adjacent properties to the west.

Access around the Project Site

Access within the APZ and through the remainder of the property is required for bushfire protection. Site access would include an outer perimeter fire access track, which would be accompanied by an at least 20 m wide fire break in which grass cover would be managed to a similar standard to that in the APZ (**Section 4.3**). Within the Project Site access roads/fire trails would be developed to at least the standards specified in Bush Fire Coordinating Committee (BFCC) Policy No. 2/2007 *Fire trails* for Category 1 fire appliances.

Details of internal access will be specified in the Stage 2 Development Application.

4.5 Utility provision

Water

It is essential that water supplies are adequate for the protection of buildings during and following the passage of a bushfire. These supplies would provide water for internal structural fires. Connections would also need to be provided to enable water to be accessed for bushfire water supplies.

Any fire hydrants must be compliant with AS2419.1-2005 *Fire hydrant installations* (Standards Australia, 2005). Fittings should be compatible with NSW RFS vehicles. All bushfire water supplies should be located close to the commencement of fire access tracks and be sign-posted in a manner consistent with BFCC Policy No. 2/2007 *Fire trails*.

Fire water supply details will be specified in the Stage 2 Development Application.

Gas and electricity

Electricity and any gas service provision would be located and maintained so that they do not exacerbate bushfire risks to the facility or its occupants. Consistent with the PBP recommendations for SFPP developments, on-site electrical services should be provided underground. Any LP gas services would be installed and maintained in accordance with AS1596-2014 *The storage and handling of LP gas* (Standards Australia, 2014).

Details of electricity and any other service provision will be provided in the Stage 2 Development Application.

4.6 Emergency planning

As a large, secure correctional facility, it is assumed that emergency evacuation in case of bushfire would not be considered. Emergency responses would instead be focused on supporting occupants of the facility in place during a bushfire event, effective bushfire responses by emergency service agencies and the provision of fire water supplies. These would be supported by planned and programmed maintenance of the APZ and internal access tracks.

To comply with requirements for SFPP developments under PBP, a bushfire emergency plan would be prepared in accordance with AS3745-2010 *Planning for emergencies in facilities* (Standards Australia, 2010). It is anticipated that any bushfire emergency plan would recommend training exercises between the facility's operators and staff and NSW RFS personnel, to ensure safe and efficient bushfire responses.

4.7 Property maintenance

Maintenance of low bushfire fuel hazard levels within the Project Site (beyond the APZ) is essential in providing a safe environment for people occupying the facilities. Pasture grasses in cleared areas would be managed by grazing and/or slashing to prevent the accumulation of potential bushfire fuels. Grasses would be maintained at no more than 10 cm height when cured.

Landscaped areas have not yet been identified but will be included in the Stage 2 design. Provided these landscaped areas are planted along the along the boundaries of the Project Site and comprise low shrubs and groundcovers, they will not add materially to the Project Site's bushfire risk. However any landscaped areas should not extend into any of the APZ and any accumulations of dead plant material along their inner boundary should be removed regularly.

4.8 Potential environmental impacts of proposed bushfire protection measures

Potential environmental impacts of the proposed BPM are largely confined to the clearing of remnant native vegetation within the cleared zone of the Project. Since this clearing is proposed to occur regardless of bushfire protection measures, clearing for the latter is not considered to be an additional environmental impact.

Construction of the internal fire trails would involve minor local soil disturbance along their routes and localised disruption to overland flow paths (at up to three points). The latter would be addressed as required, potentially with the installation of culverts and standard drainage stabilisation techniques.

Proposed maintenance of the APZ and grassland areas would largely replicate the historical management of the property and have no additional environmental impact.

4.9 Managing bushfire ignitions on the Project Site

BPM described in this section are primarily concerned with fires in the landscape surrounding the Project Site and the risks they pose to the facility and its users. The facility is also a potential source of bushfire ignitions which could affect the Project Site, its infrastructure and users, as well as surrounding properties. The main risks arise from maintenance of the facility and the property in which it is to be located. The two key hazards and proposed bushfire protection measures are described in **Table 4-1**. BPM are described in terms of:

- *Preparatory measures:* actions which are undertaken prior to and during the main bushfire season to contain the spread of any fire which ignites and reduce its impact.
- *Operational measures:* daily actions to prevent bushfire ignition, particularly on days with elevated fire danger.

Table 4-1 Proposed measures to prevent bushfire ignitions during maintenance operations

Potential source of ignition	Recommended bushfire protection measures
Grassland and vegetation maintenance throughout the property.	**Preparatory measures:** • Maintain 20 m fire break (with fire trail) around cleared perimeter of Project Site, landscape / vegetation buffers and/or retained native vegetation. Maintain grasses in fire break at ≤10 cm height at all times and ≤5 cm when cured. • Maintain APZ around the facilities as per **Section 4.3**. • Maintain any internal access tracks with the APZ as per **Section 4.4**. • Maintain fire water supplies as per **Section 4.5**. Details of these measures will be specified in the Stage 2 Development Application. **Operational measures:** • Avoid operation of slasher/mower for property maintenance on days when FDR is “severe” or greater and on any days of Total Fire Ban. • Carry a knap sack filled with water when using slasher/mower on days with high FDR or above. • Do not light fires for vegetation management within the APZ and do not light fires elsewhere on the property without a RFS permit or on any days when FDR is “very high” or greater. Always construct a mineral earth fire break around any area or fuel heap to be burnt and always have a fire water supply present. Details of these measures will be specified in the Stage 2 Development Application.
Hot work: work other than use of a slasher/mower which may generated sparks and ignite a fire (e.g. welding, use of angle grinder).	**Preparatory measures** • As per grassland and vegetation maintenance. **Operational measures:** • Do not undertake hot work in close proximity to accumulations of flammable material. Clear any grassy or other fuels from around site where hot works are to be undertaken. • Avoid hot work on days when FDR is “severe” or greater and on any days of Total Fire Ban. • Carry a knap sack filled with water when undertaking hot work during declared fire danger periods and days with FDR of high or greater. Details of these measures will be specified in the Stage 2 Development Application.

5. Bushfire protection measures during construction of the Project

5.1 Overview

Planning for Bushfire Protection (NSW RFS, 2006) is primarily concerned with BPM for the operational phase of SFPP and other developments and does not address BPM during construction. This section provides an overview of bushfire risks during the construction of the Project and potential projection measures. It is recommended that the construction contractor develop a bushfire management plan for the construction period and that this is agreed with NSW RFS.

Construction phase BPM are described in this working paper after those applying to the operation of the Project. This is because the regulatory framework for bushfire planning considers the as-built construction and operations of a development and not the actual construction process. Further, BPM for the operational life of the Project provide the framework for those implemented for construction activities.

5.2 Key bushfire risk scenarios

During construction, the Project Site would be exposed to the same scenarios for bushfires in the surrounding landscape as it would be during the facility's operation (refer to **Section 4.2**). Construction activities pose additional risks for on-site ignitions which may result in a fire escaping to surrounding properties. The latter mainly arise from hot work (activities with the potential to generate sparks and cause fire ignitions), vegetation clearing and management and use of vehicles on site.

5.3 Bushfire protection measures

The lead construction contractor would develop a Bushfire Management Plan to describe how bushfire risks would be managed during this phase. Recommendations on the types of preparatory and operational bushfire protection measures are given in **Table 5-1**.

Table 5-1 Recommended bushfire protection measures during construction of the Project

Preparatory measures	Operational protection measures
• Construct and maintain 20 m fire breaks around perimeter of property (subject to approval for clearing) and around the perimeter of the construction site. • Construct and maintain site access track and fire break and other access tracks to standards for Category 1 fire appliances, as per Bush Fire Coordinating Committee (BFCC) Policy No. 2/2007 *Fire trails.* • Maintain temporary on-site fire water supply of at least 20,000 litres. Ensure water supply has fittings which are compatible with NSW RFS. • Develop on-site assembly and evacuation points. • Hazardous and/or flammable chemicals and fuels to be stored in designated and signed area(s), with at least 20 m closely maintained grassy or mineral earth fire break and ≥70 m clearance to remnant vegetation and potential sources of embers or ignition.	• Manage hot work within main construction site to avoid risk of bushfire ignition. Avoid hot work outside main construction site on days with FDR of severe or higher and any day of total fire ban. • Avoid use of slasher for fire break maintenance on days when FDR is severe or greater and on any days of Total Fire Ban. Carry filled knap sack when using slasher/mower during potential fire season (September-February). • Do not light fires for vegetation management without a RFS permit or on any days when FDR is very high or greater. Always construct a mineral earth fire break around any area or fuel heap to be burnt and always have a fire water supply present. • Mobile plant and vehicles to carry filled knapsack or similar through prescribed fire danger period and any day when FDR high or greater. • Keep construction site free of litter and rubbish.

5.4 Potential environmental impacts of proposed bushfire protection measures

Potential environmental impacts of the proposed BPM largely arise from the clearing of remnant native vegetation within the Project Site's cleared zone and establishment of the firebreak and fire trails. These were considered in **Section 4.8**. Since clearing of the cleared zone would occur regardless of bushfire hazard, it is considered that there are no additional environmental impacts which result solely from implementation of bushfire protection measures.

6. Conclusions and recommendations

6.1 Bushfire hazard assessment

The Project is to be constructed on two allotments (Lot 26 DP 751376 and Lot 1 DP 1190399) near Lavadia, south-east of Grafton. The Project Site has a total area of 195 ha and supports a mix of pasture grassland and tall open forest with a grassy understorey. The majority of the native vegetation is connected with larger patches on adjacent landholdings to the west and south. It is proposed that all woody vegetation within a defined "cleared zone" be removed as part of the Project.

BPL mapping published by the Clarence Valley Council does not show the Project Site to be bushfire prone. However, based on the type of vegetation and the connection between patches of remnant vegetation in this area, and the assessment of bushfire risk completed in **Section 3.3**, it is considered that Project Site and the vegetated land surrounding the site has a high bushfire risk.

With the removal of remnant native vegetation from the cleared zone, there will be at least 100 metres separation between vegetation considered to have a high bushfire risk and the main structures to be constructed as part of the facility (wherever within the Development Zone they are located; refer to **Figure 1-3)**. Thus their bushfire attack level is anticipated to be BAL-low and no specific protective measures for ember attack or radiant heat exposure are required.

6.2 Bushfire risk scenarios

The bushfire season in the Clarence Valley generally commences in early September and finishes in late February/early March. As a result of the area's relatively humid climate, days with greatly elevated fire danger are uncommon. They mostly occur during spring and on days with strong, warm, dry westerly winds.

Two main bushfire risk scenarios facing the Project Site have been identified as part of this assessment:

- *Scenario 1:* fire approaching the Project Site through native vegetation and pasture lands, under the influence of strong, dry, warm westerly winds. Such conditions would elevate fire danger and potentially contribute to dangerous and unpredictable fire behaviour. In such a scenario, a relatively intense bushfire could approach the Project quite rapidly and burn in bushland to the edge of the Project's allotments. Such a fire could cut access to the Project from the south and west
- *Scenario 2:* fire approaching the Project Site through pasturelands and/or native vegetation under the influence of strong, but mild and relatively humid winds from the south to north-east. Milder conditions would reduce the intensity and rate of spread of such a fire relative to one envisaged under the first scenario. Such a fire may also cut access to the Project from the south and west. Once constructed, the upgraded Pacific Highway would reduce the exposure of the Project from the south and south-east.

6.3 Bushfire protection measures

BPM for the Project have been developed to take account of the risks posed by these two scenarios, particularly the first and more hazardous of the two. They are predicated on the facility not being evacuated (under all foreseeable circumstances) in case of an approaching bushfire. BPM reflect the requirements of *Planning f*or *bushfire protection* (NSW RFS, 2006) and the treatment of the Project as a Special Fire Protection Purposes development. Most measures cannot be fully elaborated until the reference or final design and operation of the Project is known.

Key BPM includes:

- *APZ:* which provide a buffer zone between bush fire hazards in the surrounding properties and buildings to be constructed as part of the Project. A 100 m wide APZ is recommended and would mitigate exposure to excessive radiant heat, flame, ember and smoke attack. It would provide an adequate defendable space for firefighters and other emergency services personnel.

- *Internal access roads:* which provide safe operational access into the Project Site; around the APZ; and around the perimeter of the property. Access road details would be specified as part of the Stage 2 Development Application.
- *Utility provision:* the water supply system will be required to provide adequate water supplies for bushfire responses during and after the passage of a fire front. Electricity and any gas services would need to be located safely. Details would be specified as part of the Stage 2 Development Application.
- *Emergency planning:* suitable emergency management arrangements would be devised and documented in the Stage 2 Development Application.
- *Property maintenance:* low bushfire fuel hazards would be maintained throughout the property, with grasses managed by slashing and/or grazing. Tracks would be maintained to ensure accessibility by fire appliances. Any accumulations of dead plant material from landscape buffers or retained native vegetation along the property boundary would be removed.

Additional measures would be taken to reduce opportunities for site maintenance activities to ignite fires and endanger the facility and/or surrounding properties. These mostly relate to avoidance or management of “hot” activities which could generate sparks or otherwise ignite fires during periods of elevated fire danger.

A similar set of BPM would likely apply during the construction of the Project, with fire breaks and access tracks being constructed, fire water supplies provided and controls for hot works developed and implemented. Protection measures would be detailed in a bushfire management plan to be prepared by the lead construction contractor.

6.4 Potential environmental impacts of bushfire protection measures

One of the key assumptions of this assessment was that native vegetation within the Development Zone and the 100 m wide APZ would be entirely removed. This means that no additional vegetation removal would be specifically required for any other BPM. Environmental impacts associated with these measures would then be limited to the relatively minor impacts potentially associated with construction of any additional access tracks, which will be addressed in the Stage 2 Development Application.

Environmental impacts resulting from BPM implemented during the Project’s construction phase are not anticipated to be additional to those applying to its operations.

6.5 Recommendations

#	Recommendation	Rationale
1	The lead contractor for the Project would develop a bushfire management plan to identify and manage bushfire-related risks to the Project and from its construction.	The contractor needs to manage its risks from bushfires and those arising from its activities. There are insufficient details at this stage to develop a bushfire management plan for the construction phase.
2	Key bushfire protection measures required for the Project’s post-construction operations should be developed and implemented during the construction phase. These include: construction of fire trails and fire breaks; provision of fire water supplies; and the implementation of controls on hot works with potential to ignite fires.	Operational stage BPM should, as far as possible, integrate with those required for the Project’s operations. The BPM specified are likely to form the basis of effective bushfire protection during the construction process.

#	Recommendation	Rationale
3	The suitability of access to the Project Site by NSW RFS fire appliances from the north and south/west should be assessed. If roads are inadequate for safe access, their upgrading would be incorporated into the Project's construction.	Since both main bushfire risk scenarios could result in site access being cut from the south/west, an alternative access from the north is required. Both access routes need to be assessed to ensure safe and rapid access for NSW RFS fire appliances is possible.
4	Construction of the Project would incorporate BPM which are consistent with the requirements of *Planning for bushfire protection 2006* and the recommended measures described in **Section 4** of this assessment. These measures would be specified in the Stage 2 Development Application and may include: • Establishment of a 100 m wide APZ around the NGCC and any support service areas. • Construction of appropriate access into the facility and around the property. • Provision of a fire water supply. • Underground provision of electricity to the facility and safe provision of any gas supplies. • Development of a bushfire emergency plan as part of the facility's emergency management plan. • Conduct of joint bushfire response training activities by NSW RFS and NGCC operators. • Operational controls which reduce the risk of on-site bushfire ignitions due to property maintenance and other hot work conducted in throughout the property.	The Project is deemed to be a SFPP development and requires BPM which are consistent with that status. Safe work procedures are required to reduce the risk of bushfire ignitions from maintenance activities conducted within the property but outside the main Project precincts.
5	BPM would be developed in conjunction with the NSW RFS.	RFS are a key stakeholder and source of subject matter expertise in bushfire protection and will be the bushfire emergency service provider. They require confidence in the protection measures proposed and need to understand how they may safely respond to bushfire incidents involving the Project Site.

This working paper has considered and fulfilled the SEAR No 11 as detailed in **Table 1-2** to provide a bushfire hazard report that addresses the requirements for Special Fire Protection Purposes development under *Planning for Bushfire Protection* (NSW RFS, 2006).

7. References

Bush Fire Coordinating Committee [BFCC] 2007. Policy No. 2/2007 *Fire trails.*

Clarence Valley Bush Fire Management Committee [CVBFMC] 2008. *Bush fire risk management* plan.

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