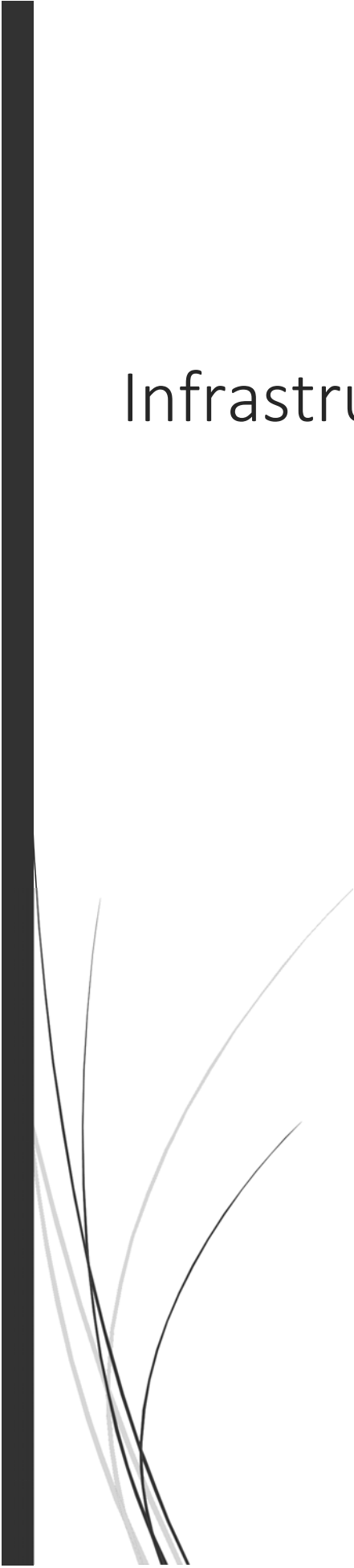




Appendix D

Infrastructure Management Plan

New Grafton Correctional Centre SSDA 7413
INFRASTRUCTURE NSW

New Grafton Correctional Centre

Infrastructure New South Wales

Infrastructure Management Plan

Final | V04

1 August 2016



New Grafton Correctional Centre

Project No: IA101200
Document Title: Infrastructure Management Plan
Document No.: Final
Revision: V04
Date: 1 August 2016
Client Name: Infrastructure New South Wales
Client No: NGCC EIS Support
Project Manager: Rachel Vazey
Author: Andrew Spinks
File Name: \\Jacobs.com\ANZ\IE\Projects\04_Eastern\IA101200\02 Documents_Final
Report_20160801\ToIssue\IA101200_NGCC_Infrastructure Management
Plan_Final_20160801_ToIssue.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
Draft	20/05/2016	Practice Review	ACS	RSV	RSV
Final	22/06/2016	Practice Review	RSV	ACS	RSV
Final v2	7/07/2016	Updates following client review	RSV	ACS	RSV
Final v3	01/08/2016	Updates following client review	RSV	ACS	RSV

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Appendix A. Traffic and Access Working Paper

Appendix B. Utilities and Services Working Paper

Appendix C. Water Cycle Management Plan Working Paper

Appendix D. Water Supply Working Paper

Appendix E. Wastewater Servicing Working Paper

Terms and acronyms used in this document

Term	Definition
APZ	Asset protection zone
CSNSW	Correctional Services New South Wales
DPE	Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
INSW	Infrastructure New South Wales
LGA	Local Government Area
MVA	Mega-volt Ampere
NGCC	New Grafton Correctional Centre
NSW	New South Wales
OSD	On site detention
PBP	Bush Fire Protection
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	Comprised 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 development application.
RFS	Rural Fire Service
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011.</i>
SRD	State and Regional Development
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 (DA) for the New Grafton Correctional Centre (NGCC) (the Project). The concept proposal and the Stage 1 works application comprise the Proposal.

The Project is part of the government's program of social infrastructure expansion to meet the overall needs of the correctional system in terms of efficiency and growth agendas. The Project will provide up to 1,700 new prison beds, which will significantly boost prison capacity and jobs, particularly in regional NSW.

The Project is located approximately 12.5 kilometres southeast of Grafton, within the Clarence Valley Local Government Area (LGA) at 313 Avenue Road, Lavadia (the Project Site). The Project Site is 195 hectares in size and is located on two properties: Lot 26 DP 751376 and Lot 1 DP 1190399.

This Infrastructure Management Plan provides an overview of the proposed infrastructure requirements and requisite upgrades associated with the Project, and has been prepared in response to the Secretary's Environmental Assessment Requirements (SEARs) that an Infrastructure Management Plan be prepared detailing the existing capacity and any augmentation requirements for the provision of utilities. The assumptions made herein are based on the best information available at this time, however, further detail will be required as part of the Stage 2 development application process, including an overview of the proposed staging, once the concept proposal becomes more fully defined. In addition, a construction methodology would need to be developed by the Contractor to outline the provision of the specific infrastructure requirements associated with the Stage 1 works, including the management of any potential environmental impacts.

1. Introduction

1.1 Background

Infrastructure NSW (INSW) on behalf of Corrective Services NSW (CSNSW), a division of the Department of Justice, is preparing an Environmental Impact Statement to inform a State Significant Development (SSD) application under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the concept proposal and Stage 1 development application (DA) of the New Grafton Correctional Centre (NGCC) (the Project). The concept proposal and the Stage 1 works development application comprise the Proposal.

The Project satisfies the requirements 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. The Project will be assessed as State Significant Development (SSD) under Division 4.1, Part 4 Division 4.1 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 Project were issued by the Department of Planning and Environment (DPE) on 21 December 2015.

1.2 Locality

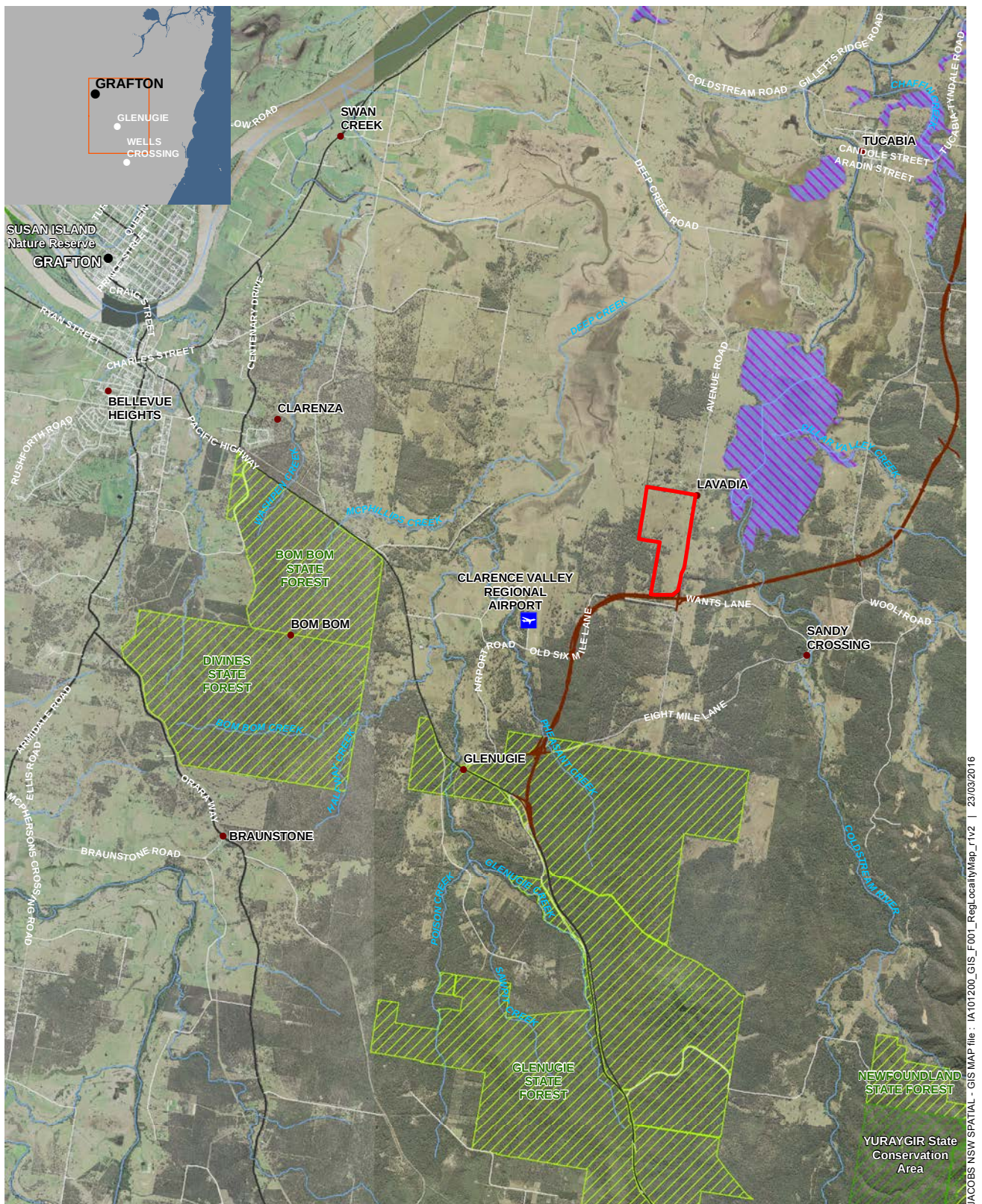
The Project is located approximately 12.5 kilometres southeast of Grafton; refer to **Figure 1-1**; within the Clarence Valley Local Government Area (LGA) at 313 Avenue Road, Lavadia. The Project is zoned RU2 - Rural Landscape under the *Clarence Valley Local Environmental Plan 2011*. Development for the purpose of a Correctional Centre is permissible with consent within the RU2 Rural Landscape zone.

The Project includes two properties comprised of Lot 26 DP 751376 and Lot 1 DP 1190399 and is 195 hectares in size; refer to **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 Lane, 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. **Table 1-1** provides a summary of the Proposal's key components and features.



JACOBS NSW SPATIAL - GIS MAP file: IA101200_GIS_F001_RegionalMap_r1v2 | 23/03/2016

Legend

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

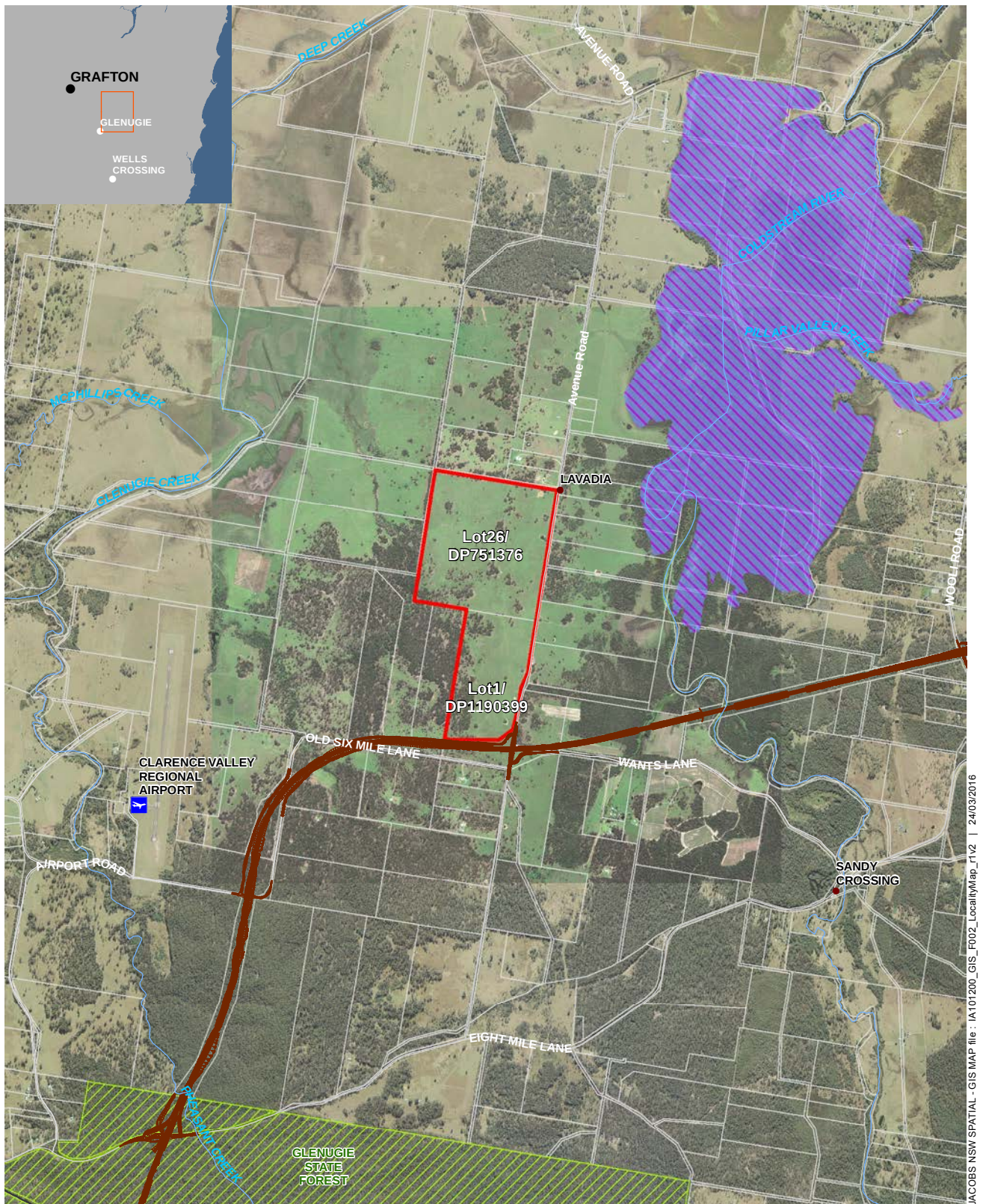
0 2 4 Km
1:125,000 @ A4



Data sources

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

Figure 1-1 | Regional Locality



Legend

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

0 1 2 Km
1:50,000 @ A4



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: • 1000 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 ha. 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 <i>Rural Fires Act 1997</i> and requirements of the <i>Planning for Bush Fire Protection</i> (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 is 195 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.



JACOBS NSW SPATIAL - GIS MAP file : IA101200_GIS_F003_Project_r3v2 | 20/06/2016

Legend

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

0 250 500 Metres

1:15,000 @ A4

Figure 1-3 | The Project

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

1.4 Project objectives

The objectives of the Project are:

- 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 Infrastructure Management Plan that will be used to support the preparation of the EIS required under part 4.1 of the EP&A Act. The structure of the report is summarised in **Table 1-2**. The SEARs relevant to this document is summarised in **Table 1-3**.

Table 1-2 Report structure

Chapter reference	Section heading	Description
Executive summary	Executive summary	Concise summary of this technical paper and the key findings
1	Introduction · Background · Locality · Project description · Project objectives · Report structure	Provides a description of the Project and the Project locality, an overview of the study objectives and an indication of the structure of this technical report.
2	Infrastructure management plan	Provides an overview of the service infrastructure required to support the Project, the current status of this infrastructure and what upgrades are required.
3	Conclusions	Outlines the future requirements with regards to the provision of service infrastructure for the Project.

Table 1-3 Summary of SEARs relevant to this specialist working paper

SEARs
SEAR No 12 - Utilities Prepare an Infrastructure Management Plan detailing the existing capacity and any augmentation requirements of the development for the provision of utilities, including wastewater management. The Plan shall also detail staging of any infrastructure works.

2. Infrastructure management plan

Table 2-1 provides an overview of the proposed infrastructure requirements and requisite upgrades associated with the Project. This has been prepared in response to the SEARs (**Table 1-2**) that an Infrastructure Management Plan be prepared detailing the existing capacity and any augmentation requirements for the provision of utilities.

The staging of these works cannot be confirmed at this stage as it will depend on the staging to construct the Project. Accordingly, this will need to be addressed as part of the Stage 2 Development Application.

The specific requirements for infrastructure associated with undertaking the Stage 1 works are unclear at this stage. This existing house, which is provided with water, toilet, power and phone facilities, would likely be used as the construction compound for the Stage 1 works. However, additional service infrastructure might still be required, eg portable toilets, additional water, gas etc. Accordingly, the Contractor will need to develop a Construction methodology which details the provision of the requisite utilities for the Stage 1 works, as well as identify appropriate measures to manage potential impacts that might be associated with the provision of these facilities.

Table 2-1 Overview of the proposed infrastructure requirements and requisite upgrades associated with the Proposal

Infrastructure type	Project requirements	Current status	Proposed upgrade(s)	Reference to working paper
Roads	Vehicle access to the Project Site would include the following: - Provision for construction phase traffic during the Stage 1 works of approximately 20 vehicles per day. This volume is likely to increase significantly during the Stage 2 works, but exact volumes will need to be confirmed as part of the Stage 2 Development Application. - Provision for operational phase traffic of approximately 1600 vehicles per day (two-way) with a peak of approximately 250 vehicles entering/exiting the site between 2 pm to 3 pm each day.	The 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 is a single lane, surfaced road running north south between Eight Mile Lane to the south and Deep Creek Road to the north. It connects to the Pacific Highway via Eight Mile Lane. - Old Six Mile Lane forms a priority controlled intersection with the Pacific Highway to the north of Eight Mile Lane. It provides access to Clarence Valley Regional Airport and continues east to connect to Avenue Road. From about 100 metres east of the airport entrance to Avenue Road, Old Six Mile Lane is unsurfaced. Both of these roads have low traffic volumes and are operating well above Level of Service C. It is noted that the upgraded Pacific Highway, to be constructed by Roads and Maritime Services, will pass to the south of the Project Site and align with Old Six Mile Lane once completed in approximately 2019. As part of that project, Avenue Road will pass over the Pacific Highway and the intersection of	Avenue Road would provide access to the site during both construction and operation: - This additional Stage 1 construction traffic demand would be well within the capacity of the local roads, although the safety of vehicle movements would need to be monitored and passing places may need to be improved along Avenue Road. Although the Stage 2 construction traffic would create a substantial relative increase in vehicle numbers, since existing traffic numbers are very low, the increase would likely be comfortably within the capacity of the local roads. The later impact will need to be confirmed as part of the Stage 2 Development Application. - It would be necessary to upgrade Avenue Road, either by widening it between the site and Eight Mile Lane or by providing improved passing places, to accommodate operational traffic. It is also likely to be necessary to upgrade the intersection of Eight Mile Lane and Avenue Road. In particular, it is recommended that Avenue Road be widened to accommodate two-way traffic at the intersection to safely allow vehicles to wait on Avenue Road as vehicles turn into Avenue Road from Eight Mile Lane.	Traffic and Access Working Paper (Appendix A)

Infrastructure type	Project requirements	Current status	Proposed upgrade(s)	Reference to working paper
		Avenue Road and Old Six Mile Road will be upgraded to improve local access, without direct connection to the highway.		
Electricity	The estimated electrical maximum demand for the Project is anticipated to be approximately 15 mega-volt ampere (MVA).	No existing electricity connection is available in the immediate vicinity of the Project.	Essential Energy is likely to supply the development connection point from the nearest zone substation at Koolkhan and provide the Project with a dedicated electrical feed. The connection to the electricity network would most likely be via an overhead line from the Koolkhan substation to the site, a distance of approximately 24 kilometres. Two preliminary alignment options have been identified for routing the transmission line from the zone substation to the Project Site boundary, although a preferred option has not been identified.	Utilities and Services Working Paper (Appendix B)
Natural Gas	Although natural is not specifically required for the Project, it could be used to supplement other power sources, for example within the main kitchen and laundry facilities. The specific requirements would depend on the final design of the Project.	No natural gas infrastructure is located in the vicinity of the site or in the greater Grafton area.	Any requirement for natural gas as part of the final design would require gas to be transported to site and stored in on site tanks.	Utilities and Services Working Paper (Appendix B)
Telecommunications	Telecommunication services required for the Project are likely to entail a single mode	Telstra have advised that the following telecommunications services are present in the area: · An existing communications copper	Copper line connection could be provided from the existing copper cable along Avenue Road. The existing Telstra fibre optic cables are	Utilities and Services Working Paper (Appendix B)

Infrastructure type	Project requirements	Current status	Proposed upgrade(s)	Reference to working paper
	fibre optic cable and 50 copper line connections.	cable located along the western edge of Avenue Road and southern edge of Old Six Mile Lane/ Wants Lane. An existing fibre optic cable located in the vicinity of the Clarence Valley Regional Airport.	located approximately three kilometres from the Project and would require installation of new fibre optic cable from the connection point at Clarence Valley Regional Airport to the Project site.	
Stormwater	Catchment analysis has confirmed that on site detention (OSD) of approximately 5,709 m ³ is required for the Project.	The Project site currently comprises pastoral lands and accordingly has no formal drainage facilities. The Project Site has a ridge generally running in a north/south direction through the centre of the site. The site falls away from the ridge line toward the east, in the direction of the Coldstream River, or towards the unnamed creeks to the west. There is a roadside channel beside the northbound lane of Avenue Road, which currently extends along the eastern boundary of the Project Site and captures part of the surface flow from the Project Site.	The OSD storage volume requirement can be provided through either above-ground storage basins in landscaped areas or rainwater tanks. It is anticipated that OSD can be provided in stages in accordance with the Project staging. Stormwater could be considered for beneficial onsite use, for example irrigation.	Utilities and Services Working Paper (Appendix B) Water Cycle Management Plan Working Paper (Appendix C)
Water	An IWMSim assessment was undertaken to simulate the likely operation of the Project from a water demand and use perspective. The demands adopted include average daily demand of 0.8 mega litres (ML) and peak day demand of 1.2 ML.	Water supply infrastructure in the vicinity of the Project Site is limited. A DN500 Council main maintained by Clarence Valley Council (Council) runs along Swallow Road to the Pacific Highway north of Tyson Street in South Grafton (about 16 kilometres away from the Project Site). Council has indicated that this main could supply water to the Project, however, no system performance review considering the proposed water demand has been	The proposed strategy is to pump water from a Council connection point via a new 16 kilometre long DN150/200 rising main to a new 1.2 ML reservoir. Options would include an elevated or a surface reservoir. For a surface reservoir, booster pumps would need to be provided on site to ensure adequate water pressure across the site (that is, a minimum of 20 metre pressure). Due to the size of the tank and low water usage during the early stages of the Project, water age could be an issue. A chlorine	Water Supply Working Paper (Appendix D)

Infrastructure type	Project requirements	Current status	Proposed upgrade(s)	Reference to working paper
		undertaken.	dosing unit is proposed on site to improve water quality.	
Wastewater	An IWMSim assessment was undertaken to simulate wastewater flows from the Project. The average inflow of wastewater to the onsite facility at ultimate capacity adopted is 590 kilolitres per day (kL/d).	Council's existing Clarenza sewage treatment plant is located approximately 10 km from the site. Council has stated that due to the distance from the Council's sewerage system, a rising main transfer to the Clarenza sewage treatment plant is not feasible as the detention time in the rising main would mean that the current treatment train would be unable to treat the sewage. Hence wastewater servicing would be provided from an on-site wastewater management system.	The preferred option consists of onsite treatment of the sewage generated by the Project. A portion of the treated effluent would be reused within the facility via a dual reticulation system (for compatible uses such as irrigation of playing fields, water for cooling towers and toilet/urinal flushing). The remainder of the treated effluent would be used for an agricultural irrigation scheme located on the remaining land at the site, including an irrigation storage dam. This would be established at the site to maximise reuse of effluent and, provided there is sufficient area available for irrigation and a suitable storage dam is constructed onsite, all remaining effluent can be reused. This would avoid any discharge of treated effluent to the environment. This approach maximises reuse by including irrigation of the remaining open spaces at the site, outside of the correctional facilities, in addition to the dual reticulation reuse system.	Wastewater Servicing Working Paper (Appendix E)

3. Conclusions

This report has provided an overview of the proposed infrastructure requirements and requisite upgrades associated with the Project. Further detail will be required as part of the Stage 2 Development Application process, including an overview of the proposed staging, once the design and construction method has been more fully development. In addition, a construction methodology would need to be developed by the Contractor to outline the provision of the specific infrastructure requirements associated with the Stage 1 works, including the management of any potential environmental impacts.

Appendix A. Traffic and Access Working Paper

New Grafton Correctional Centre

Infrastructure New South Wales

Traffic and Access Working Paper

Final | V05

2 August 2016



Project Name

Project No: IA101200
Document Title: Traffic and Access Working Paper
Document No.: Final
Revision: V05
Date: 2 August 2016
Client Name: Infrastructure New South Wales
Project Manager: Rachel Vazey
Author: Amy Gregg
File Name: \\Jacobs.com\ANZ\IE\Projects\04_Eastern\IA101200\02 Documents\Final
Report_20160801\ToIssue\IA101200_Traffic and Access_Revised
final_20160801_ToIssue.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
Draft 0	25/02/2016	Draft for comment	A. Gregg	D. Lowe	A. Spinks
Final	15/02/2016	Final	A. Gregg	D. Lowe	R. Vazey
Final revised	30/05/2016	Client review	A. Lockyer	D. Lowe	R. Vazey
Final revised	22/06/2016	Client review	R. Vazey	D. Lowe	R. Vazey
Final revised	07/07/2016	Client review	R. Vazey	R. Vazey	R. Vazey
Final revised	01/08/2016	Client review	R. Vazey	R. Vazey	R. Vazey

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Terms and acronyms used in this document

Acronym	Definition
AADT	Annual Average Daily Traffic
CSNSW	Corrective Services New South Wales
DPE	Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	Environment Planning and Assessment Act 1979
INSW	Infrastructure New South Wales
LGA	Local Government Area
NGCC	New Grafton Correctional Centre
NSW	New South Wales
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	Comprised 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 development application.
SEARs	Secretary's Environmental Assessment Requirements
SEPP (SRD)	State Environmental Planning Policy [State and Regional Development] 2011
SKM	Sinclair Knight Merz
SSD	State Significant Development

Executive Summary

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 Development Application (DA) (the Proposal) for the New Grafton Correctional Centre (the Project). The Project is to be located on a 195 hectare site (the Project Site), approximately 12.5 kilometres (km) south-east of Grafton within the Clarence Valley Local Government Area.

The Project will provide up to 1,700 new maximum and minimum security beds in a new correctional centre with relevant support services and facilities. This working paper is an assessment of traffic and access impacts during construction of the Proposal and operation of the Project.

The Project Site is located in a rural location and it is recommended that the Site be accessed along Avenue Road, Eight Mile Lane and the Pacific Highway. There are no public transport, cycling or walking facilities currently in the vicinity of the site.

Construction of the Proposal is anticipated to commence in 2017 and last for 6 to 12 months. Construction would coincide with the construction of the Woolgoolga to Ballina (W2B) Pacific Highway upgrade and consultation would be undertaken with the W2B contractor to ensure the cumulative impact of construction activities are coordinated and minimised.

All construction activities and parking would occur within the site boundary and although there would be a significant increase in traffic volumes, relative to existing levels, local roads would continue to operate within capacity.

Mitigation measures during the construction of the Project include liaising with the W2B contractor, Roads and Maritime Services and Clarence Valley Council, the possible upgrade of passing places along Avenue Road depending on the phasing of construction, the production of a Traffic Management Plan and Traffic Control Plan and undertaking a dilapidation survey of the construction access route prior to construction commencing.

The parking and accesses for the operational phase of the Project would be designed to comply with AS2890 and the Northern Rivers Development and Design Manual. It is anticipated that a minimum of 500 parking spaces would be provided.

The anticipated daily profile of arrivals and departures at the Project during operation has been calculated and it was determined that a peak of 250 two-way journeys would be seen between 2 pm and 3 pm. In order to accommodate the expected operational journeys at the Project, it is recommended that the intersection of Avenue Road and Eight Mile Lane be upgraded to widen Avenue Road approximately 50 metres on the approach to intersection and the control arrangements at the intersection be formalised into a priority controlled T intersection by providing signage and line marking. It is also recommended that Avenue Road be upgraded to either improve passing places or for the road to be widened between the site and Eight Mile Lane to accommodate operational traffic.

It can therefore be concluded that with implementation of the recommended upgrades, as well as the recommended mitigation measures detailed in this assessment, the construction of the Proposal and operation of the Project could be accommodated by the local road network.

This working paper has considered and fulfilled the Secretary's Environmental Assessment Requirement (SEAR) No 7 to provide a traffic and accessibility impact assessment for the Proposal.

1. Introduction

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 Development Application (DA) (the Proposal) for the New Grafton Correctional Centre (the Project). 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.

This Traffic and Transport Assessment has been produced by Jacobs Group Australia to support of the EIS for the Project.

1.1 Locality

The Project is located approximately 12.5 kilometres 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.

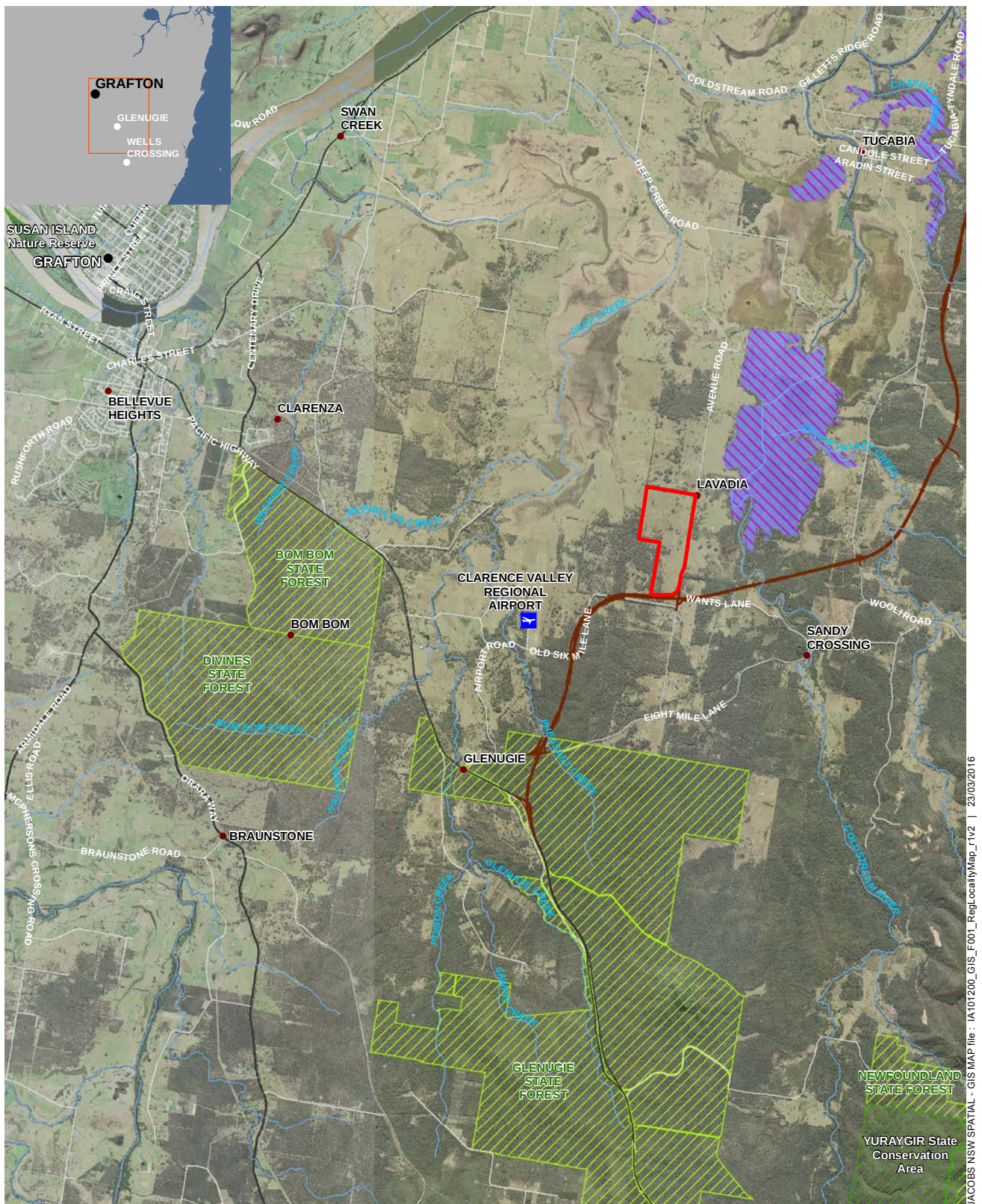
The Project Site includes two properties comprised of Lot 26 DP 751376 and Lot 1 DP 1190399 and is 195 hectares in size (refer to **Figure 1-2**). The site has historically been used for cattle grazing. In July 2015, development consent for a dwelling house in the southeast corner of Lot 1 DP 1190399 was granted by Council and construction of the house is now 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 passing the Clarence Valley Regional Airport.

It is noted that the Grafton bypass portion of the upgraded Pacific Highway project (by RMS) will, in addition to the reconfigured Old Six Mile Road, 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.

1.2 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.

Table 1-1 provides a summary of the Proposal's key components and features.



JACOBS NSW SPATIAL - GIS MAP file: IA101200_GIS_F001_RegionalMap_r1v2 | 23/03/2016

Legend

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

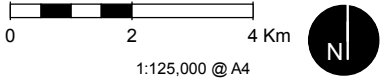
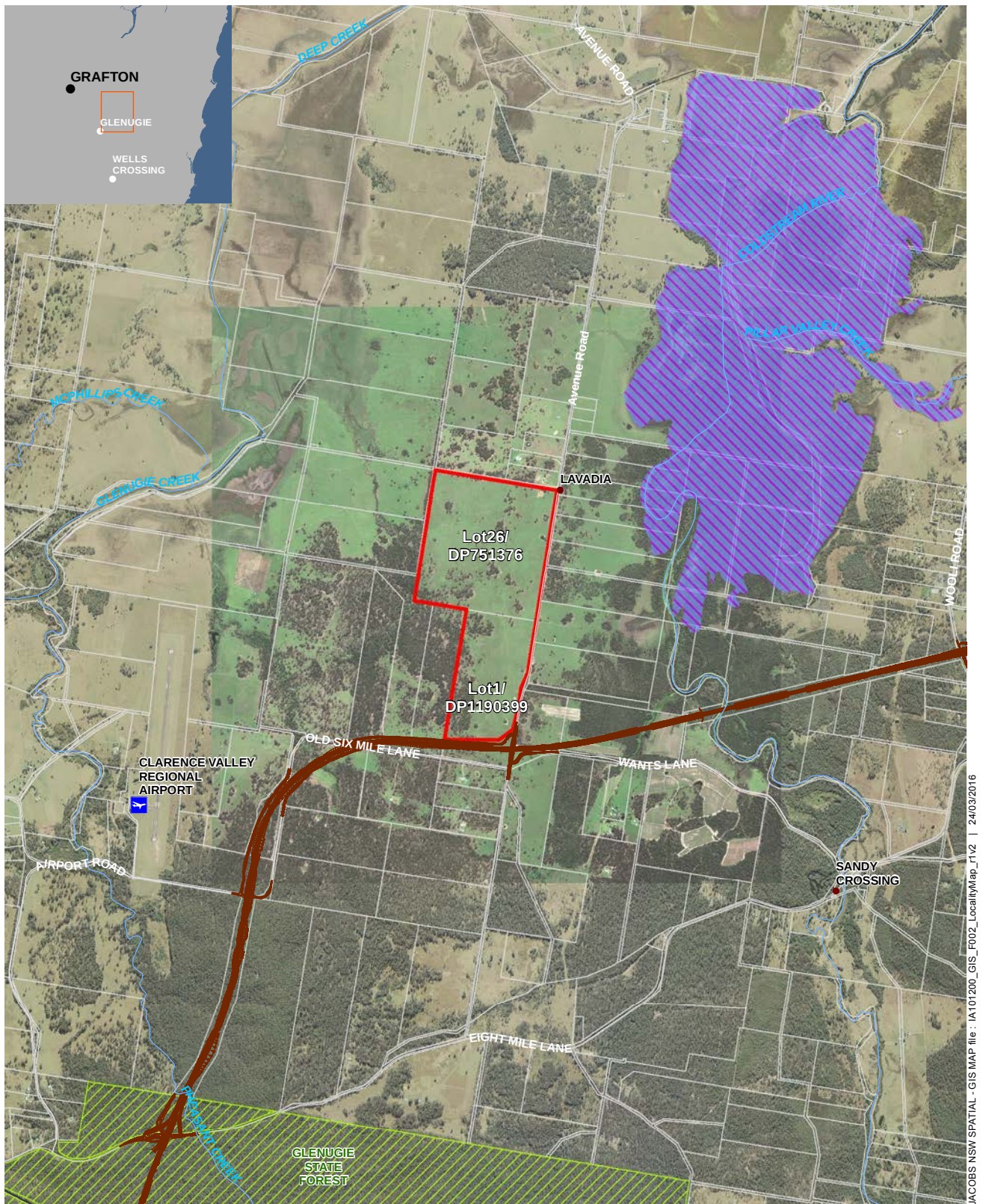


Figure 1-1 | Regional Locality

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



JACOBS NSW SPATIAL - GIS MAP file: I:\101200_GIS_F002_LocalityMap_r1v2 | 24/03/2018

Legend

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

0 1 2 Km
1:50,000 @ A4



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 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) DA, 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 Project 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 is 195 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 6 to 12 months and provide up to 50 full time equivalent positions.



JACOBS NSW SPATIAL - GIS MAP file : IA101200_GIS_F003_Project_r3v2 | 20/06/2016

Legend

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

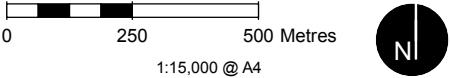


Figure 1-3 | The Project

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

1.3 Project objectives

The objectives of the Project are:

- 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.

1.4 Report structure

This report is the *Traffic and Access Working Paper* that will support the EIS required for the Proposal under Division 4.1, Part 4 of the EP&A Act. The structure of the report is summarised in **Table 1-2**.

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 · Project description · Project objectives · Report structure	Description of the Proposal relevant to potential impacts on traffic and access. Provides an overview of the study objectives and structure of the working paper.
2	Assessment requirements · Other legislative requirements	Identifies and the key legislation that this technical study must follow and lists the traffic and access criterion that the Proposal must comply with.
3	Existing environment	Establishes existing conditions such as the local road network, including the Pacific Highway upgrades that will be occurring in the vicinity of the site, local public transport and active transport facilities.

Section reference	Section heading	Description
4	Assessment and management of construction impacts · Relevant construction activities · Construction related impacts · Management of construction related impacts	Identifies key traffic and access related construction activities and assesses the potential impacts on the local environment. Establishes management measures to manage construction impacts associated with traffic and access.
5	Assessment and management of operational impacts · Relevant operational activities · Local operational impacts · Regional operational impacts · Management of construction related impacts	Identifies key traffic and access related construction activities and assesses the potential impacts of the Proposal. Establishes operational traffic and access management measures.
6	Summary and conclusions · Conclusions · Recommendations	Concise statement of key findings of the construction and operational impacts of the Proposal on traffic and access.
7	References	Provides a list of references used as part of the traffic and access assessment.
8	Terms and acronyms used in the document	Provides the definition of the terms and acronyms used in the document.

2. Assessment 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 (SSD) 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 the 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 construction of the Proposal and operation of the Project. Subsequent assessments and 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*.

A summary of the SEARs requirements relevant to traffic and access are presented below in **Table 2-1**.

Table 2-1 Summary of traffic and access SEARs

SEARs No 7	Cross Reference
Prepare a transport and accessibility impact assessment, which must address the following:	
An estimate of the daily and peak hour vehicle movements impact on nearby intersections, with consideration of the cumulative impacts from other approved developments in the vicinity and consideration for a 10 year horizon, and the need/associated funding for upgrading or road improvement works (if required).	Refer to Section 5.2 .
Detail proposed operational access arrangements and measures to mitigate any associated traffic and road safety impacts and impacts on the road network, public transport and pedestrian and cycle networks.	Refer to Sections 5.1 and 5.3 .
Demonstrate the provision of appropriate on-site car and bicycle parking, having regard to the availability of public transport and compliance with requirements of relevant car parking codes and Australian Standards (i.e. turn paths, sign distance requirements, aisle widths, etc).	Refer to Section 5.1 .
Service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type, routes and the likely arrival and departure times).	Refer to Section 5.1 .

3. Existing conditions

The Project Site location is described in detail in **Section 1.2** (refer also to **Figure 1-1** and **Figure 1-2**).

3.1 Local road network

Avenue Road is a single lane, surfaced road running north-south between Eight Mile Lane to the south and Deep Creek Road to the north. It is surrounded by farmland on both frontages and unsurfaced passing places are available along its length. Avenue Road and Eight Mile Lane are shown in the photographs below in **Figure 3-1** and **Figure 3-2** respectively.



Figure 3-1 : Avenue Road (looking south past the Project Site (on right) from the northern boundary)



Figure 3-2 : Avenue Road (looking north of the Eight Mile Lane intersection)

Eight Mile Lane runs southwest to northeast between the Pacific Highway in the southwest and Wooli Road in the northeast. It is a surfaced, two-way road and is lined by farmland. Signage and line marking is absent on Avenue Road on approach to its intersection with Eight Mile Lane. In addition, the narrow width of Avenue Road limits the ability for vehicles turning from Eight Mile Lane to pass a vehicle waiting to turn out of Avenue Road. The intersection is shown in **Figure 3-3**.



Figure 3-3 : Avenue Road at Eight Mile Lane intersection (looking west)

At the intersection of Eight Mile Lane and the Pacific Highway, the Pacific Highway is widened to provide a dedicated northbound right-turn lane into Eight Mile Lane. A southbound left-turn filter lane is also provided, minimising the impact of vehicles turning onto Eight Mile Lane on through traffic. The intersection can be seen below in **Figure 3-4**.



Figure 3-4 : Pacific Highway at Eight Mile Lane intersection (looking south)

To the north of Eight Mile Lane, Old Six Mile Lane forms a priority controlled intersection with the Pacific Highway. The intersection includes a southbound left-turn filter lane however a northbound right-turn lane is not provided. The intersection can be seen below in **Figure 3-5**.



Figure 3-5 : Pacific Highway at Old Six Mile Lane (looking south)

Old Six Mile Lane provides access to Clarence Valley Regional Airport and continues east to connect to Avenue Road. In the vicinity of Avenue Road, Old Six Mile Lane is unsurfaced, as can be seen in **Figure 3-6**.



Figure 3-6 : Old Six Mile Lane at Avenue Road intersection (looking west)

Between the intersections with Eight Mile Lane and Old Six Mile Lane (approximately 3.8 kilometres), the Pacific Highway is predominantly one lane in each direction, although approximately 800 metres of this section of the highway has two lanes northbound and a single lane southbound to allow for overtaking vehicles. A right hand turn lane and left turn filter lane are provided at the rest stop located approximately 700 metres north of Eight Mile Lane and some properties along this stretch of the highway. This area of the Pacific Highway is subject to a 100 km/h speed limit.

Available traffic data was provided by Clarence Valley Council (local roads) and Roads and Maritime Services (Pacific Highway). Given the rural location of the site, some of this data is reasonably dated, however it is still considered to provide an appropriate indication of the level of existing traffic in the vicinity of the site due to the

low level of growth in the area during this time. The available data and date it was obtained is presented below in **Table 3-1**.

Table 3-1 : Available traffic data

Location	Volume	Date of data collection	Source
Avenue Road, south of Deep Creek Road	75 Annual Average Daily Traffic	2004	Clarence Valley Council
Eight Mile Lane, northeast of the Pacific Highway	952 Annual Average Daily Traffic	2009	Clarence Valley Council
Old Six Mile Lane	33 Annual Average Daily Traffic	2005	Clarence Valley Council
Pacific Highway, Glenugie	Less than 1,000 vehicles per day	2012	Woolgoolga to Ballina Pacific Highway Upgrade EIS, Roads and Maritime Services, October 2012

As anticipated, and confirmed by the data presented in **Table 3-1**, the current volumes of traffic on the roads in the vicinity of the site are very low.

The *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002) states that on two-lane rural roads, major and minor roads should be operating at a Level of Service C, which equates to 1,030 vehicles per hour (with no heavy vehicles) to 870 vehicles per hour (with 15 per cent heavy vehicles). It can therefore be seen that the above roads are operating well above Level of Service C.

3.2 Future road network

As noted previously the upgraded Pacific Highway between Woolgoolga to Ballina (W2B) will become the southern boundary of the site (although the upgraded Old Six Mile Lane will lie between) once completed in approximately 2019. As part of the upgrade, 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.

It is noted that the final preliminary design drawings for the Avenue Road Overpass (Sheet No: SB-A05-00001 Issue 02) indicate that the bridge will be designed for traffic loading SM1600 and HLP400 in accordance with AS5100. This traffic loading accommodates semi-trailers and similarly weighted construction vehicles. Hence, construction loading on the bridge, including dynamic load factor, is not to exceed the SM1600 design load effects.

The road alignment and interchange upgrades in the vicinity of the Project Site are shown in **Figure 3-7**.

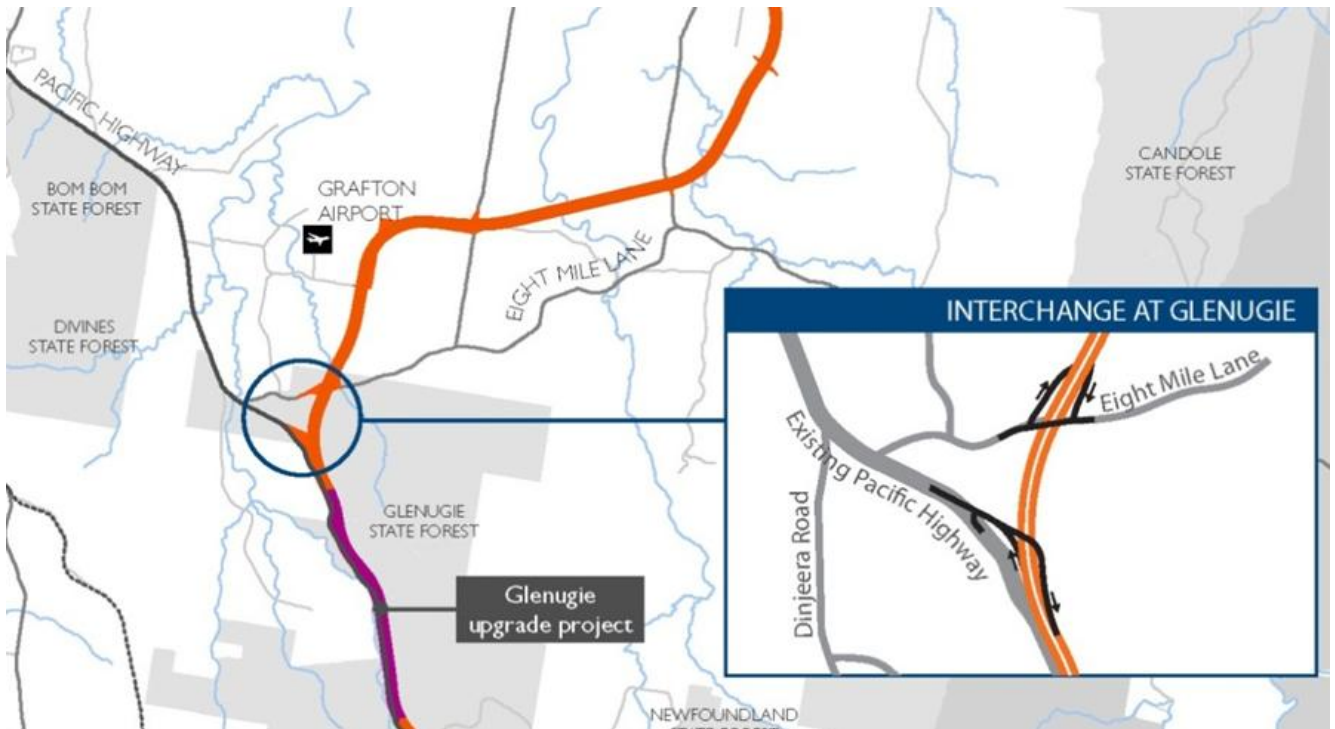


Figure 3-7 : Proposed interchange at Glenugie

Source: Woolgoola to Ballina Pacific Highway Upgrade EIS, Roads and Maritime Services, December 2012

As well as new interchanges at the existing Pacific Highway and Eight Mile Lane, the proposed Avenue Road overpass is shown below in **Figure 3-8**.

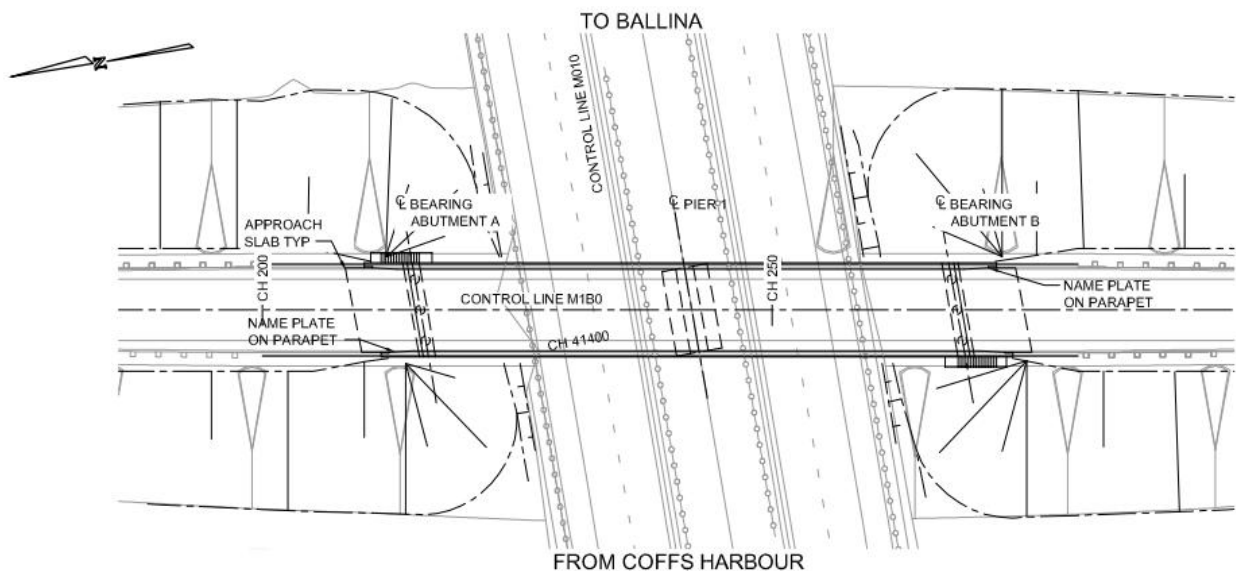


Figure 3-8 : Proposed Avenue Road overpass of Woolgoola to Ballina Pacific Highway upgrade

Source: Glenugie to Maclean Portion A – CH40870, Sheet SB-A05-00001, Roads and Maritime Services, 2 October 2015

3.3 Public transport

No buses currently operate in the vicinity of the site or from Grafton along the Pacific Highway towards Eight Mile Lane. Private coach shuttle services are available to and from Clarence Valley Regional Airport, however they are linked to flight times and bookings need to be made in advance.

3.4 Active transport

No footpaths or cycle routes are currently located in the vicinity of the site. Given the rural location, walking distances would be long and therefore walking would not be a realistic option to access the site particularly in light of the absence of public transport.

Feasibility mapping was undertaken in the early 2000s for a potential cycle route as part of the Coastline Cycleway Program. The only realistic route identified was along the alignment of the Pacific Highway between Grafton and Corrindi. The route was only ever indicative and is not current. However there is potential for a cycle route to be incorporated at a future date which would improve bicycle accessibility to the Project Site.

4. Construction impacts

4.1 Construction overview

This impact assessment has considered impacts during construction of Proposal, which 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.
- Construction of auxiliary facilities such as construction compound, construction staff parking facilities and stockpiles sites.
- Temporary provision of water, wastewater, power and communication services within the site.
- Demolition of the existing house and sheds.
- Excavation works as required.
- Landscaping.

Construction of the project is scheduled to commence mid-2017 and it is anticipated would take 6 to 12 months to complete. This assessment does not consider any of the construction works associated with upgrades to services, utilities and roads required for the Project that are not contained within the Project Site as shown in **Figure 1-2**.

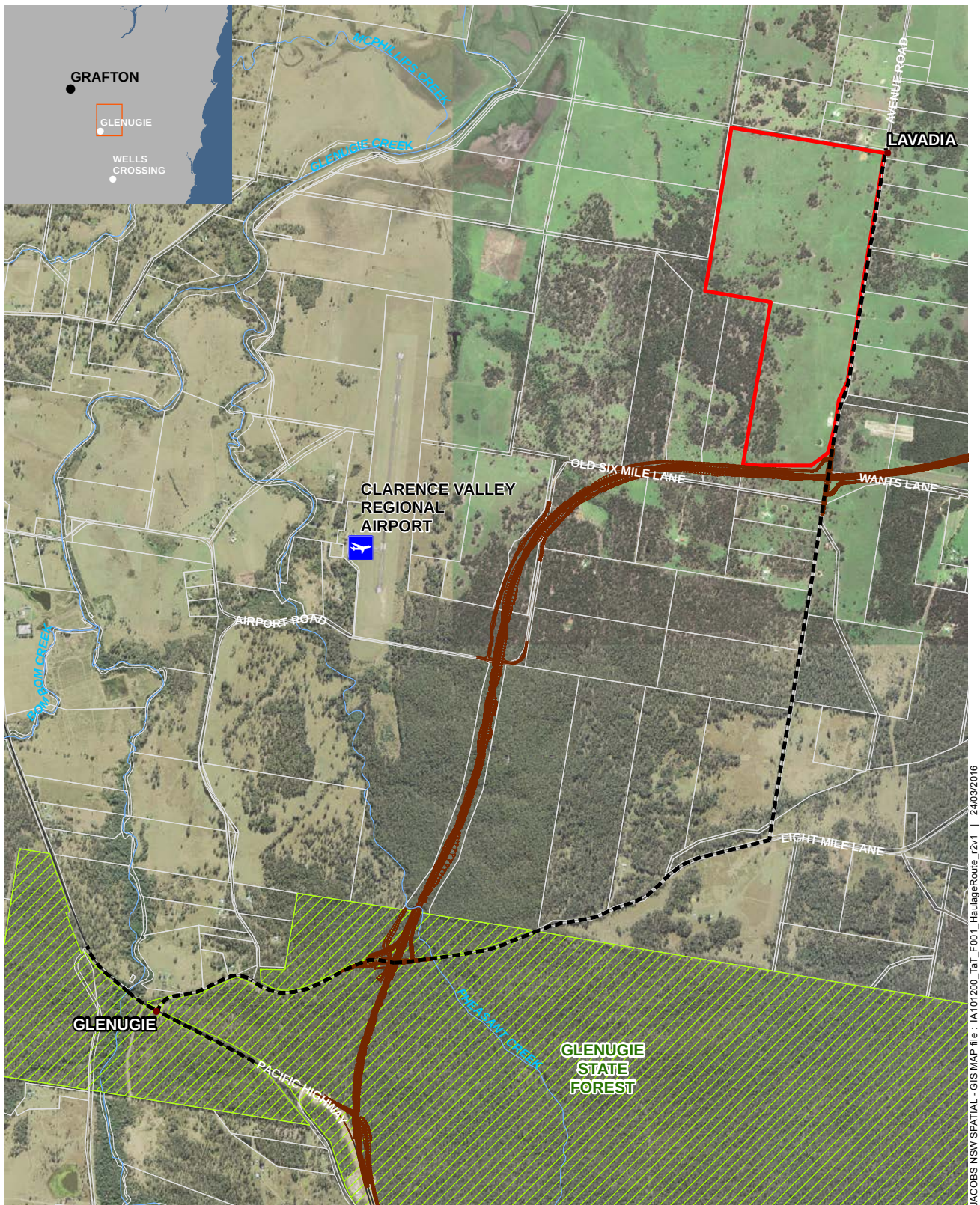
Traffic numbers during construction of the Proposal have been estimated to be approximately 20 vehicle movements per day (both directions) at the start and end of the period with vehicle numbers peaking at around 100 movements per day. Construction vehicles would include staff vehicles, heavy vehicles (classified as a Class 3 vehicle or larger in accordance with the Austroads Vehicle Classification System) and semi-trailers.

It is anticipated that construction staff would increase from approximately four construction staff on site at commencement to a peak of approximately 50 staff. Adequate construction staff parking would be provided within the site.

Normal construction hours would apply, i.e. 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturdays and no works on Sundays or Public Holidays. Out of hours works would be by exception only and would require separate assessment and approval (excluding activities that must occur for safety reasons, i.e. emergency work, or for the delivery of oversized plant and structures that the police or other authorities determine require special arrangements).

As the origin and destination of construction vehicles is currently unknown, it has been assumed that vehicles would arrive from both the north and south along the Pacific Highway and travel along Eight Mile Lane and Avenue Road to access and exit the site. This is the preferred construction route given the left slip lane and right turn lane facilities at the Pacific Highway / Eight Mile Lane intersection and since it avoids unsurfaced sections of road.

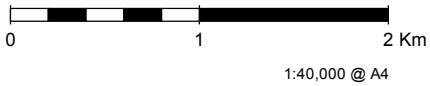
The anticipated construction route to / from the site is shown below in **Figure 4-1**.



JACOBS NSW SPATIAL - GIS MAP file: IA101200_TaT_F001_HaulageRoute_2x1 | 24/03/2016

Legend

- The Project
- Haulage Route
- Grafton Bypass (proposed)



Data sources

Jacobs 2015
LPI 2015

RMS 2013 (W2B Alliance)

Figure 4-1 | Haulage Route

4.2 Impacts on the road network

Construction vehicles would arrive and depart the site throughout the day. At the peak of construction, there would be approximately 100 vehicles arriving per day.

To provide a worst case scenario, it has been assumed that construction staff would arrive in a car individually. Therefore, construction staff would contribute a maximum of 20 light vehicles of the total, arriving at the site between 6.30 am and 7 am and departing the site between 6 pm and 6.30pm. The remaining approximately 30 construction vehicles of the construction peak would arrive and depart the site throughout the day between 7 am and 6 pm at the average rate of approximately four vehicles per hour arriving and four vehicles per hour departing the site. This equates to, on average, one vehicle every 7.5 minutes on the local road network.

Table 4-1 below presents the impact of the anticipated construction traffic on the local road network.

Table 4-1 : Construction traffic impact

Location	Existing traffic volume	Average hourly construction traffic	Total vehicles per hour
Avenue Road	Approx. 7 vehicles per hour	8	15
Eight Mile Lane	Approx. 80 vehicles per hour	8	88
Pacific Highway	Approx. 80 vehicles per hour	8	88

Note: Existing Annual Average Daily Traffic data has been distributed over an 11 hour day to provide a robust baseline

It can be seen from the above table that the additional construction vehicles would create a negligible increase in vehicle numbers, however, existing traffic numbers are very low and the increase would comfortably be within the capacity of the local roads. Consequently, the number of additional vehicles involved would not result in a reduction in the current operational performance of the local roads.

Vehicles would be travelling both northbound and southbound on Avenue Road, therefore, the safety of vehicle movements would need to be monitored and passing places may need to be improved.

When construction staff arrive and depart, a maximum peak of up to 20 additional cars within a 30 minute period would access the site and then exit the site at the end of the day. However, the additional traffic demand would continue to be well within the capacity of the local roads and vehicles would be travelling in the same direction therefore eliminating the safety impacts associated with passing vehicles on Avenue Road.

4.3 Cumulative impacts

The W2B upgrade is anticipated to open to traffic in 2019, therefore, its construction may overlap with the construction of the Project. In order to assess the cumulative impact of the Project and the Pacific Highway upgrade, the Working Paper: Traffic and transport assessment (SKM, August 2012) and the EIS Chapter 14 – Traffic and transport (Roads and Maritime Services, December 2012) prepared for the W2B project have been reviewed and the following information has been extracted from these documents.

Impacts on the local roads in the vicinity of the site resulting from the construction of W2B (refer to **Figure 3-7**) include:

- Eight Mile Lane would be diverted onto a temporary side track for the construction of the new overpass. The side track would be constructed within the road corridor, probably to the south of the existing road and the new overpass alignment, and would be of a similar standard to the existing road.
- Old Six Mile Lane crosses the alignment of the W2B at three locations with a new overpass and two connecting roads (east and west of the road corridor) provided to maintain existing traffic access. Traffic access would be maintained along Old Six Mile Road during the construction with the actual provisions being dependent on the construction staging adopted.

- Avenue Road would need to be diverted onto a temporary side track for the construction of the new overpass. The side track would be constructed within the road corridor to the south of the existing road and the new overpass alignment to a similar standard to the existing road.
- Wants Lane would need to be diverted clear of the Avenue Road overpass site. This would be achieved by construction of the connecting road and a connection to the Avenue Road side track.

As there will be a large amount of activity in the vicinity of the Project Site during the anticipated construction period of the Project it will be crucial for the construction programme to be designed in close consultation with the W2B contractor in order to minimise impacts to the construction of the Project.

Table 4-4 of the *Working Paper: Traffic and transport assessment* (SKM, August 2012) indicates a peak of 910 haulage trucks per day from the area in the vicinity of the Project, or 83 vehicles per hour across a standard construction day. The peak cumulative two-way hourly vehicles of this proposal and the W2B project may be approximately 274 vehicles per hour. Co-ordination of construction vehicle movements between the two projects would need to be undertaken.

Although the cumulative impact of the two projects would result in an increase in vehicles relative to the current level of traffic, particularly in the proportion of heavy vehicles, the total peak hourly volumes would remain within the road capacity of Eight Mile Lane and the Pacific Highway. Avenue Road is a relatively narrow single carriageway road and, therefore, to accommodate the increase in two-way traffic, improved and additional passing places may need to be provided to facilitate effective flow of two-way traffic.

4.4 Mitigation

Construction programming and staging for the Project would be undertaken in close consultation with the W2B contractor, the Roads and Maritime Services and Clarence Valley Council to ensure the cumulative impact of the two projects is minimised.

Dependent upon the final construction phasing of each project, and the status of Avenue Road at the time of peak construction for the Project, passing places may need to be improved or additional places provided along Avenue Road to accommodate the peak level of two-way construction traffic for the Project.

The site access would be designed to accommodate two-way movements and would be located to provide maximum sight distance in both directions. A road safety audit of the proposed access would be undertaken prior to the commencement of substantial construction.

As indicated in **Section 3.2** the final preliminary design drawings for the Avenue Road Overpass (Sheet No: SB-A05-00001 Issue 02, Roads and Maritime Services) indicate that the bridge will be designed for traffic loading SM1600 and HLP400 in accordance with AS5100. This traffic loading accommodates semi-trailers and similarly weighted construction vehicles. Hence, construction loading on the bridge, including dynamic load factor, is not to exceed the SM1600 design load effects.

A Traffic Management Plan would be developed to facilitate the safe and efficient movement of traffic through and around all intersections and the local road network.

A Traffic Control Plan would be prepared in accordance with Australian Standard 1742.3 and Roads and Maritime Service's *Guide to Traffic Control at Work Sites* Version 4 (2010) by a suitably qualified person.

Other relevant reference documents that would be considered in the management of potential impacts would include:

- Australian Standard AS1742.3 – 2009, *Manual of uniform traffic control devices – Traffic control for works on roads*.
- Roads and Maritime Services, *QA Specification G10 Control of Traffic*, Edition 4 / Revision 2 (2005).
- Austroads, *Guide to Traffic Management Part 3: Traffic Studies and Analysis* (2009).

As part of detailed construction management planning, a dilapidation survey of the construction access route would be undertaken along the construction route prior to construction commencing.

Additional traffic and access assessment would be required to be completed as part of the Stage 2 DA in order to assess the detailed design footprint and the traffic associated with construction of the facility.

5. Operational impacts

5.1 Operation overview

The operational assessment looks at the environmental impacts of a 1,700 bed correctional facility with approximately 600 staff, which is considered to be a 10 year horizon scenario. The 1,700 bed facility would have one access point from Avenue Road that will not be defined until the Stage 2 DA. The primary road access to the Project would be via Avenue Road, Eight Mile Lane and the Pacific Highway.

It is anticipated that there would be up to 200 regular staff on site at any one time, operating over three shifts each day. Between shifts there would be a one hour hand over period for staff and, therefore, staff parking would need to accommodate up to 450 parking spaces. It is anticipated that staff would be travelling from Grafton, Coffs Harbour or other towns and villages in the area.

Visitors to the Project would be permitted between 10 am and 3 pm daily. There will be a visitation area that would provide 50 spaces available for one to two hour visits. Visitors would be travelling from all over the region. The car park layout would be designed in accordance with AS2890 with regard to parking modules, circulation roadways, the access driveway and motorcycle parking.

A delivery / loading area, including turning area, would be provided to accommodate the anticipated size and frequency of delivery vehicles to the site.

A stopping sight distance of greater than 160 metres, as required for a 100 km/hr road¹, is required for the access driveway, however, this may require the removal of trees along the site frontage on Avenue Road. The vehicular access locations will be designed in accordance with AS2890 and the *Northern Rivers Development and Design Manual*. The stopping sight distance requirements will need to be considered in the detailed design and assessed in the Stage 2 DA.

5.2 Impact

Given the forecast staff, visitor and delivery/servicing numbers at the site, the following vehicle movements are anticipated during operation:

- 200 staff would be working per shift with three shifts across the day, likely to be 7 am to 3 pm, 3 pm to 12 am and 12 am to 7 am, with a one hour handover period². Assuming a worst case scenario, where all staff drive in a car on their own, the following staff trip profile would be seen at the site:
 - 200 staff arrive at the site between 6.30am and 7 am, 200 staff exit the site between 8 am and 8.30am.
 - 200 staff arrive at the site between 2.30 pm and 3 pm, 200 staff exit the site between 4 pm and 4.30pm.
 - 200 staff arrive at the site between 11.30 pm and 12 am, 200 staff exit the site between 1 am and 1.30 am.
- Approximately 50 visitors would enter the site per hour between 10 am and 2 pm and approximately 50 visitors would exit the site between 11 am and 3 pm daily.
- Deliveries and inmate transportation would occur as and when required, with approximately 5 vehicles anticipated to arrive at the site each day.

The daily profile of two-way trips anticipated at the site is shown below in **Figure 5-1**.

¹ AS2890.1

² Handover period assumed to occur for the hour after the end of a shift / the first hour of the new shift

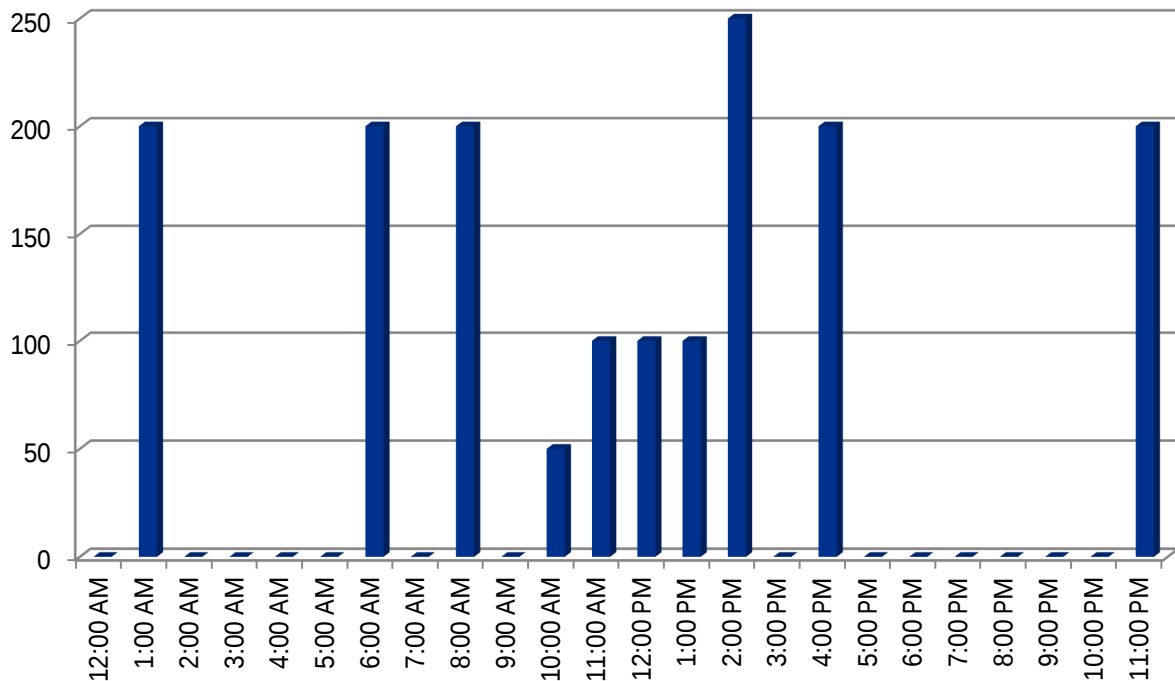


Figure 5-1 : Two-way operational trips

Based on the figure above, it can be seen that the peak number of two-way journeys anticipated at the site during operation would occur between 2 pm and 3 pm, when staff would be arriving to start a shift and visitors would also be exiting the site. This peak hour at the site would see approximately 250 vehicles entering and exiting the site.

These trips would enter and exit via Avenue Road, Eight Mile Lane and then distribute north and south along the Pacific Highway.

Given the low level of existing traffic on Eight Mile Lane, the addition of the anticipated Project traffic would result in the road network continuing to operate well within capacity. The trips are also expected to have an insignificant impact on the Pacific Highway, as they would distribute to the northwest on the existing highway, or northeast or south on the upgraded Pacific Highway.

Given the increased level of vehicles anticipated at the site once operational, it is recommended that the intersection of Eight Mile Lane and Avenue Road be upgraded. It is recommended that Avenue Road be widened to accommodate two-way traffic at the intersection to safely allow vehicles to wait on Avenue Road as vehicles turn into Avenue Road from Eight Mile Lane.

There may be some minor traffic volume increases on Six Mile Lane given the proposed upgrade of the road and the shorter travel distance it provides to the site. However, given the low level of existing traffic on Six Mile Lane, impacts of the increased traffic are expected to be minimal.

5.3 Mitigation

As discussed above, it is recommended that the intersection of Eight Mile Lane and Avenue Road be upgraded to accommodate two-way traffic along Avenue Road for at least 50 metres on the approach to the intersection. Pavement markings and Give Way signs should also be installed on Avenue Road to provide a formalised priority controlled T-intersection.

Avenue Road is currently a relatively narrow single carriageway road carrying very low volumes of traffic. The Project would introduce an increase in two-way traffic from what is currently experienced, it is therefore

recommended that Avenue Road be upgraded to either improve passing places or for the road to be widened between the site and Eight Mile Lane to accommodate operational traffic.

If the intersection of Eight Mile Lane and Avenue Road, as well as Avenue Road itself is upgraded, the traffic and access impacts of the Project would not generate a material impact on the local road network.

Any upgrades to Avenue Road and the intersection of Eight Mile Lane and Avenue Road would be subject to additional assessment and approvals.

The stopping sight distance requirements of the NGCC will need to be considered in the detailed design and assessed in the Stage 2 DA.

To mitigate potential impacts on Six Mile Lane, the preferred access route for inmate transfers that will be followed to and from the Project site will be via Avenue Road, Eight Mile Lane and the Pacific Highway.

6. Summary and conclusions

This traffic and access assessment has been undertaken by Jacobs Group Australia to accompany the EIS for a New Grafton Correctional Centre located approximately 12.5 kilometres southeast of Grafton within the Clarence Valley Local Government Area. The site is located in a rural location and would be accessed via Avenue Road, Eight Mile Lane and the Pacific Highway. There are no public transport, cycling or walking facilities currently in the vicinity of the site.

This impact assessment has considered impacts during construction of the Proposal, which includes vegetation clearance, earthworks and other preparatory work within the cadastral boundaries of Lot 26 DP 751376 and Lot 1 DP 1190399. Construction of the project is scheduled to commence mid-2017 and it is anticipated would take 6 to 12 months to complete. Construction may coincide with the construction of the Woolgoolga to Ballina (W2B) Pacific Highway upgrade and consultation would be undertaken with the W2B contractor to ensure the cumulative impact of construction activities are coordinated and minimised.

All construction activities and parking would occur within the site boundary and although there would be a minor increase in traffic volumes, relative to existing levels, local roads would continue to operate within capacity.

Mitigation measures during the construction of the project include liaising with the W2B contractor, Roads and Maritime Services and Clarence Valley Council, the possible upgrade of passing places along Avenue Road depending on the phasing of construction, the production of a Traffic Management Plan and Traffic Control Plan and undertaking a dilapidation survey prior to construction commencing. Additional traffic and access assessment would be required to be completed as part of the Stage 2 DA in order to assess the detailed design footprint and the traffic associated with construction of the facility.

The parking and accesses for the Project would be designed to comply with AS2890 and the Northern Rivers Development and Design Manual. A minimum of 450 staff parking spaces and up to 50 visitor parking spaces would be provided.

The anticipated daily profile of arrivals and departures at the facility during operation of the Project has been calculated and it was determined that a peak of 250 two-way journeys would be seen between 2 pm and 3 pm. In order to accommodate the expected operational journeys at the Project, it is recommended that the intersection of Avenue Road and Eight Mile Lane be upgraded to widen Avenue Road approximately 50 metres on the approach to the intersection and the control arrangements at the intersection be formalised into a priority controlled T intersection by providing signage and line marking. It is also recommended that Avenue Road be upgraded to either improve passing places or for the road to be widened between the site and Eight Mile Lane to accommodate operational traffic.

It can therefore be concluded that with implementation of the recommended upgrades, as well as the recommended mitigation measures detailed in this assessment, the construction and operation of the Project could be accommodated by the local road network. This working paper has considered the SEARs No 7 to provide a traffic and accessibility impact assessment for the Project. In doing this, this report has met the relevant sections of SEARs No 7 as issued for the Project; refer to **Table 2-1**.

7. References

Austroads (2006), *Automatic Vehicle Classification by Vehicle Length*

Austroads (2009), *Australian Standard AS1742.3*

Austroads (2009), *Guide to Traffic Management Part 3: Traffic Studies and Analysis*

AUS_SPEC Joint Venture (August 2016), *Northern Rivers Development and Design Manual*

Council of Standards Australia, *Australian Standard AS2890*

Roads and Maritime Services (2 October 2015), *Glenugie to Maclean Portion A – CH40870, Sheet SB-A05-00001*

Roads and Maritime Services (2010), *Guide to Traffic Control at Work Sites, Version 4*

Roads and Traffic Authority (2002), *Guide to Traffic Generating Developments*

Roads and Maritime Services (December 2012), *Woolgoola to Ballina Pacific Highway Upgrade EIS*

Roads and Maritime Services (2005), *QA Specification G10 Control of Traffic, Edition 4/Revision 2*

Sinclair Knight Merz (SKM) (August 2012), *Woolgoolga to Ballina Pacific Highway Upgrade Working Paper: Traffic and transport assessment*

Appendix B. Utilities and Services Working Paper

New Grafton Correctional Centre

Infrastructure New South Wales

Utilities and Services Working Paper

Final | V06

1 August 2016



New Grafton Correctional Centre

Project No: IA101200
Document Title: Utilities and Services Working Paper
Document No.: Final
Revision: V06
Date: 1 August 2016
Client Name: Infrastructure New South Wales
Client No: NGCC EIS Support
Project Manager: Rachel Vazey
Author: Brian Soo
File Name: J:\IE\Projects\04_Eastern\IA101200\02 Documents_Final
Report_20160801\ToIssue\IA101200_NGCC_Uilities Working Paper_Revised
Final_20160801_ToIssue.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
Draft	23/02/2016	Practice Review	Brian Soo	James Khor	Andrew Spinks
Final	23/03/2016	Address comments and finalise	Vivira Samuel/ Brian Soo	Rachel Vazey	Rachel Vazey
Revised Final	20/05/2016	Updated to include revised project description	Andrew Spinks	Rachel Vazey	Andrew Spinks
Revised Final	22/06/2016	Updated to include revised project description	Rachel Vazey	Andrew Spinks	Rachel Vazey
Revised Final	07/07/2016	Updated to include revised project description	Rachel Vazey	Rachel Vazey	Rachel Vazey
Revised Final	01/08/2016	Updated to include revised project description	Rachel Vazey	Rachel Vazey	Rachel Vazey

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Terms and acronyms used in this document

Acronym	Definition
CSNSW	Correctional Services New South Wales
CUP	Central Utility Plant
DBYD	Dial Before You Dig
DPE	Department of Planning and the Environment
EIS	Environmental Impact Statement
INSW	Infrastructure New South Wales
LGA	Local Government Area
LPG	Liquefied petroleum gas
NBN	National Broadband Network
NGCC	New Grafton Correctional Centre
NSW	New South Wales
OSD	On Site Detention
PSD	Permissible Site Discharge
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	Comprised 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 development application
SEAR	Secretary's Environmental Assessment Requirements
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011</i> (SRD SEPP)
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 (DA) for the New Grafton Correctional Centre (NGCC) (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. This Utilities and Services Working Paper was prepared in support of the EIS, specifically to consider the requirements in terms of the provision of broader service infrastructure to the property. The concept proposal and the Stage 1 works application comprise the Proposal. The Project is located approximately 12.5 kilometres southeast of Grafton, within the Clarence Valley Local Government Area (LGA) at 313 Avenue Road, Lavadia (the Project Site). The Project Site is 195 hectares in size and is located on two properties: Lot 26 DP 751376 and Lot 1 DP 1190399.

Utilities services infrastructure in the vicinity of the subject property is limited, with the only extant infrastructure being Telstra communications conduits and aerial electrical cables. No gas infrastructure is located in the vicinity of the site or in the greater Grafton area.

The estimated electrical maximum demand for the Project is anticipated to be approximately 15 mega-volt ampere (MVA). Essential Energy is likely to supply the development connection point from the nearest zone substation at Koolkhan and provide the Project with a dedicated electrical feed. The connection to the electricity network would most likely be via an overhead line and would need to cover a significant distance – approximately 24 kilometres – in order to connect the Project to the nearest zone substation.

Telstra have advised that existing fibre optic cable is located in the vicinity of the Clarence Valley Regional Airport and that it may be possible to provide communication services to the Project from this location. The existing fibre optic cables are located approximately three kilometres from the Project and would require installation of new fibre optic cable from the connection point at Clarence Valley Regional Airport to the Project site.

Under the current Council stormwater management requirements, the Project is required to provide for approximately 5,709 cubic metres of On-Site Detention (OSD) storage volume. This would need to be accommodated within the Project Site.

This report has provided a review of the existing utilities and services (excluding wastewater) in the vicinity of the Project Site. The augmentation requirements for the development of stormwater, electrical and telecommunication infrastructure have been outlined in this report. This report also addresses the on-site detention requirements for the operation stage of the Project. In doing this, this report has assisted the project in meeting the Secretary's Environmental Assessment Requirements (SEARs) No 12 and 14.

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 Development Application (DA) for the New Grafton Correctional Centre (NGCC) (the Project). The concept proposal and the Stage 1 works development application comprise the Proposal.

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

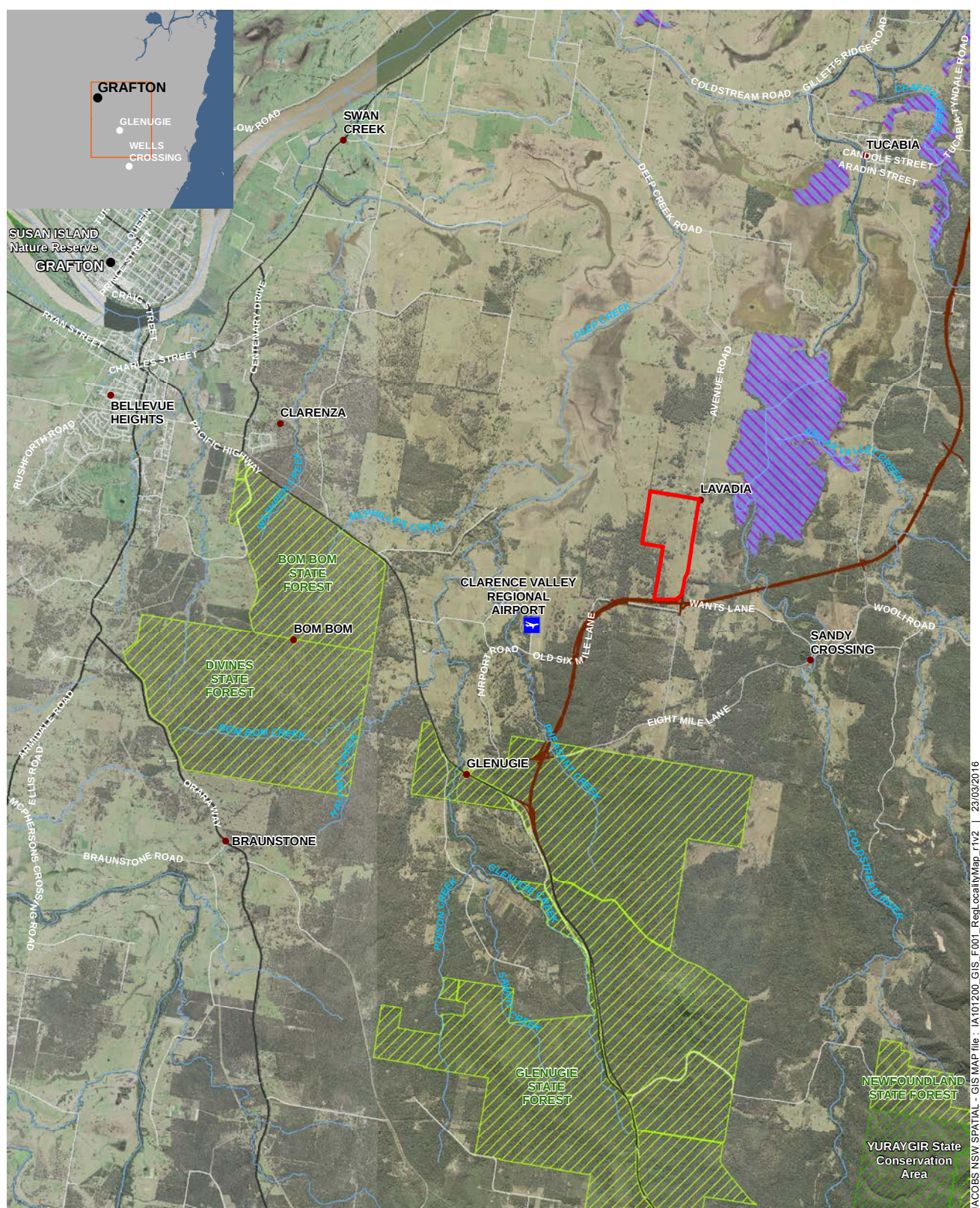
The Project is located approximately 12.5 kilometres southeast of Grafton (refer to **Figure 1-1**) within the Clarence Valley Local Government Area (LGA) at 313 Avenue Road, Lavadia (the Project Site). The Project is located on land zoned RU2 - Rural Landscape under the *Clarence Valley Local Environmental 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 in size (refer to **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 RMS) 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.

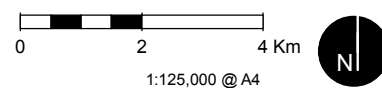
1.3 Project description

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

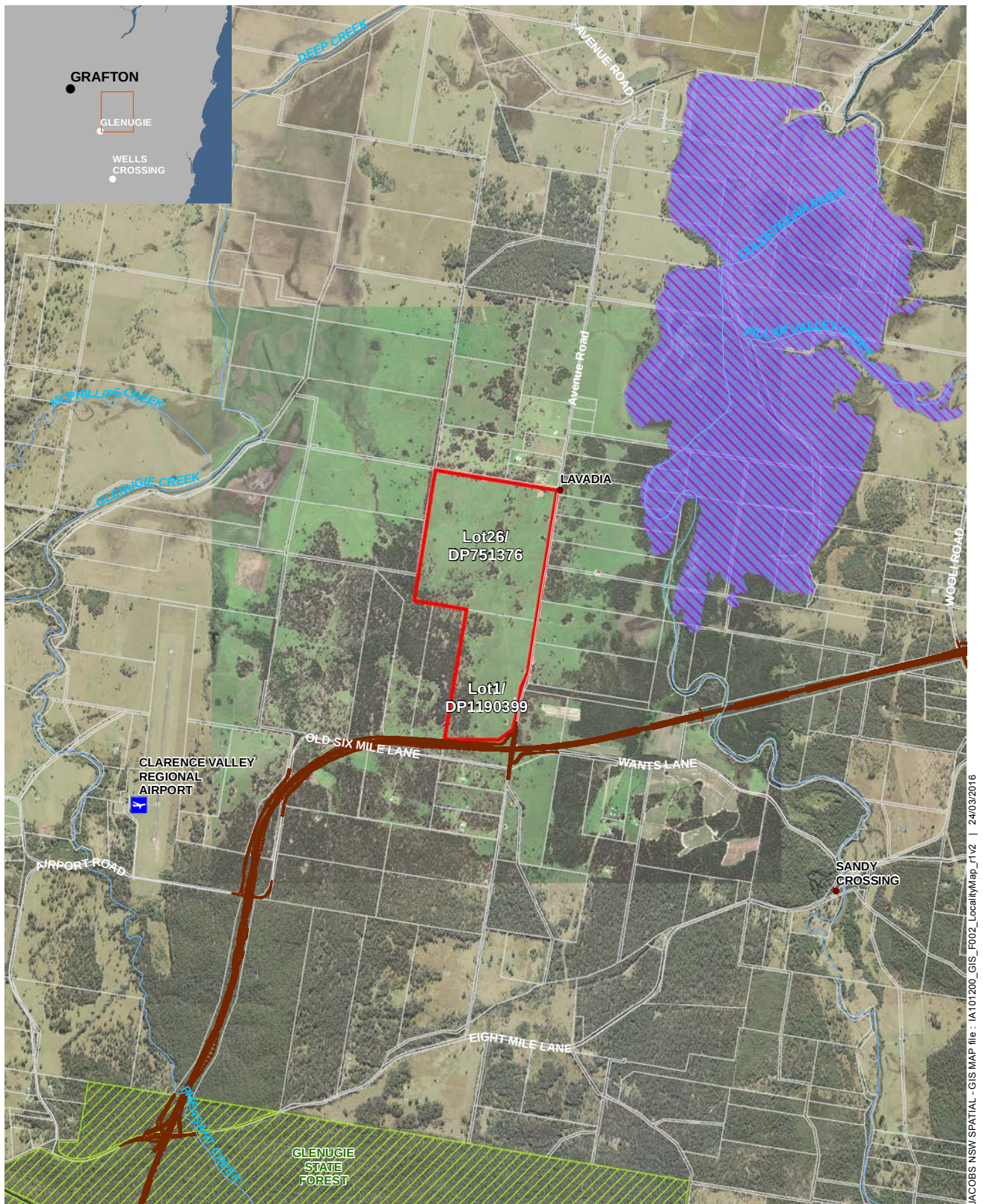
-  The Project
  SEPP 14 Wetlands
-  Grafton Bypass (proposed)
  National Park Reserves
-  State Forests



Data sources

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

Figure 1-1 | Regional Locality



Legend

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

0 1 2 Km
1:50,000 @ A4



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: • 1000 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 ha. 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 <i>Rural Fires Act 1997</i> and requirements of the <i>Planning for Bush Fire Protection</i> (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 Project 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 is 195 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.



JACOBS NSW SPATIAL - GIS MAP file : IA101200_GIS_F003_Project_r3v2 | 20/06/2016

Legend

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

0 250 500 Metres

1:15,000 @ A4

Figure 1-3 | The Project

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

1.4 Proposal 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 Utilities and Services Working Paper supports the EIS as required under Division 4.1, Part 4 of the EP&A Act. The structure of the report is summarised in **Table 1-2**. SEARs relevant to this specialist 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	Description of the project relevant to potential impacts on utilities and services. Provides an overview of the study objectives and structure of technical report.
2	Assessment requirements Other legislative requirements	Identifies and the key legislation that this technical study must follow and lists the any relevant criterion that the Project must comply with.
3	Existing utility infrastructure	Establishes local utilities services and baseline infrastructure conditions.
4	Assessment of infrastructure requirement	Identifies key utilities services demand and assesses the potential utilities services impacts and strategy.
5	Conclusions and recommendations - Conclusions - Recommendations	Concise statement of key findings of the construction and operational impacts of the Project on utilities and services.

Table 1-3 Summary of SEARs relevant to this specialist working paper

SEARs	Cross-reference
SEAR No 12 - Utilities Prepare an Infrastructure Management Plan detailing the existing capacity and any augmentation requirements of the development for the provision of utilities, including wastewater management. The Plan shall also detail staging of any infrastructure works.	Addressed in Chapters 3 and 4. Wastewater is addressed in a separate working paper (Water Cycle Working Paper).
SEAR No 14 - Drainage Provide a storm water concept plan detailing how water quality and quantity impacts on drainage systems would be managed.	Addressed in Section 4.2. At this stage the section only addresses on-site detention requirements. Further detail regarding the stormwater concept plan would be confirmed in the Stage 2 DA.

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 (SSD) 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.

A staged development application is being provided for the Project in accordance with Section 83B and Section 89D of the EP&A Act. The EIS, and this working paper, provides an assessment of the the Proposa 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 Proposal were issued by DPE on 21 December 2015 in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

This Utilities and Services Working Paper has been prepared to address the relevant requirements outlined in the SEARs. In response to the SEARs, on-site stormwater detention requirements has been considered. Further detail regarding the stormwater concept plan would be confirmed in the Stage 2 DA. The plan seeks to identify appropriate stormwater treatment and drainage guiding parameters for the detailed design of the Project. The plan is based on the best-practice engineering. This plan is outlined in **Section 4.1** of this working paper.

2.2 Guidelines

The current Northern Rivers Local Government *Handbook of Stormwater Drainage Design* requires that on-site detention (OSD) of stormwater is provided for in development projects larger than dual occupancy and for multi-unit, commercial and industrial developments. Accordingly, this requirement would apply to the Project.

3. Existing utilities infrastructure

3.1 Stormwater drainage

The Project Site is comprised mainly of grassland with small clusters of trees spread across the northern portion and extensive stands of trees along the western extent of the southern portion. The Project Site has a ridge generally running in a north/south direction through the centre of the site. The site falls away from the ridge line toward the east, in the direction of the Coldstream River, or towards the unnamed creeks to the west that feed into Deep-Glenugie Creek. Both drainage systems eventually drain north to the major Clarence River approximately 10 kilometres to the north west. There is a roadside channel beside the northbound lane of Avenue Road, which extends along the eastern boundary of the Project Site. This channel currently captures part of the surface flow from the Project Site.

3.2 Electrical

From a power supply perspective, the area abutting the Project Site is characterised by rural uses. Accordingly, the electrical infrastructure within the immediate vicinity of the Project Site and expected the infrastructure have been designed to cater for rural type load requirements and is unlikely to possess the capability of handling the proposed load requirements for the Project.

An enquiry has been submitted to the local electricity authority, Essential Energy, to obtain an indication of the existing electricity network, to identify potential connection opportunities and to understand their connection requirements for a development of the type and scale envisaged.

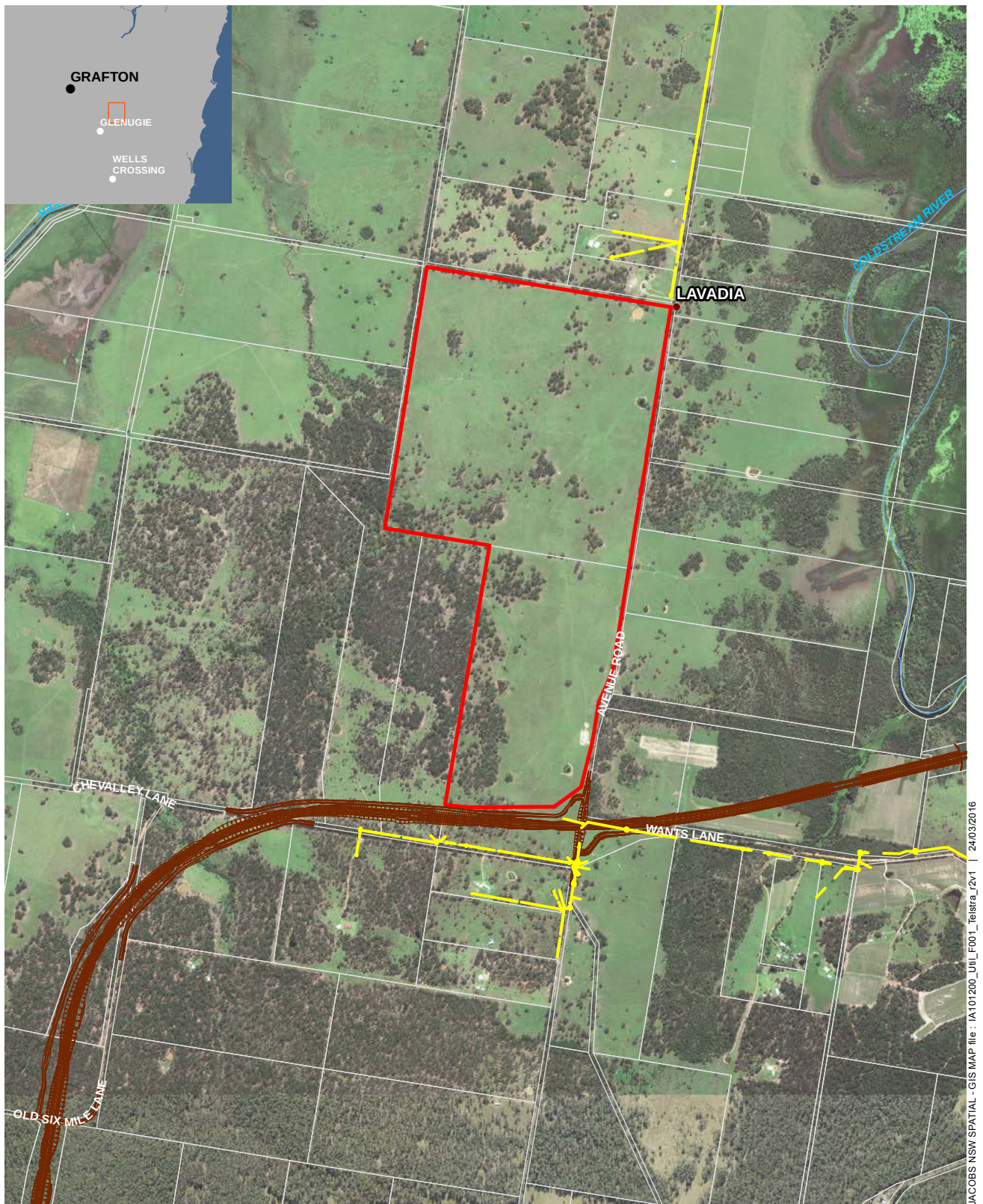
Correspondence with Essential Energy has indicated that a new zone substation would be required to facilitate the load requirements indicated above. The closest connection point is located at the TransGrid operated Koolkhan 132 kV to 66 kV and 11 kV substation. The most cost-effective design would involve building a local substation (either 132 kV to 11 kV or 66 kV to 11 kV) on the Project Site with the distribution of the power through the site at 11 kV, with step down transformers located at each load centre to supply a mains voltage of 415 V.

3.3 Telecommunication

Based on Dial Before You Dig (DBYD) information, an existing Telstra communication copper cable is located along the western edge of Avenue Road terminating at the northern property boundary of the Project Site and the southern edge of Old Six Mile Lane/ Wants Lane, refer to **Figure 3-1**. This copper cable currently services the surrounding residential properties. In addition, Telstra also indicate that an existing 36 core fibre optic cable is located in the vicinity of Clarence Valley Regional Airport to the west of the Project Site.

3.4 Gas

DBYD information indicates that there is no gas infrastructure in the vicinity of the Project Site or the greater Grafton area. Accordingly any gas supply to the Project would need to be trucked to the site which is unlikely to prove economically viable.



JACOBS NSW SPATIAL - GIS MAP file: IA101200_UJI_F001_Telstra_2v1 | 24/03/2016

Legend

- The Project
- Location of Telstra assets
- Grafton Bypass (proposed)

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1:25,000 @ A4



Data sources

Jacobs 2015

LPI 2015

RMS 2013 (W2B Alliance)

Figure 3-1 | Existing Telstra infrastructure

4. Assessment of infrastructure requirement

4.1 Stormwater drainage

4.1.1 Detention basins

The standard OSD calculation sheet has been adopted in determining the OSD requirement for the Project (in accordance with the requirements specified in the Northern Rivers Local Government Handbook of Stormwater Drainage Design). The OSD requirements for the Project would be expected to ensure that the post-development peak flows leaving the development do not exceed the pre-development peak flow rates for the required storm event.

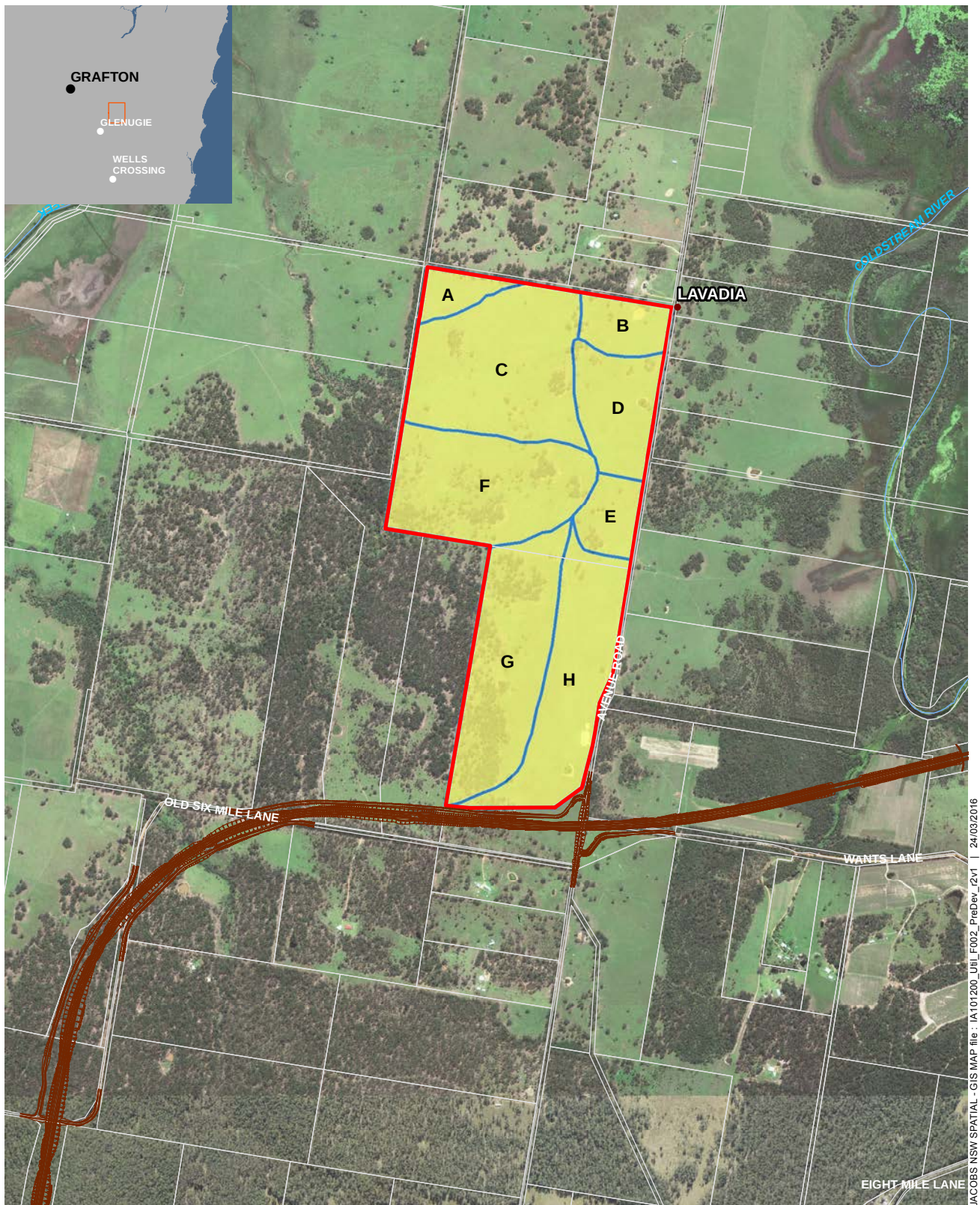
4.1.2 Catchment analysis

An internal catchment analysis was undertaken to determine the catchment area pre-development and post-development. The pre-development catchment areas are outlined in **Table 4-1** and the boundaries are identified in **Figure 4-1**.

Table 4-1 Pre-development catchment areas

Catchment zone	Catchment area (m ²)
A	57,405.74
B	90,898.27
C	442,874.76
D	179,245.70
E	85,666.10
F	382,116.81
G	372,299.14
H	345,614.64
Total	1,956,121

Pervious and impervious areas assumed for the Project are summarised in **Table 4-2**. The post development catchment boundaries would be confirmed as part of the Stage 2 Development Application.



Legend

- The Project
- Pre-Development Catchment Boundaries
- Grafton Bypass (proposed)

0 0.5 1 Km
1:25,000 @ A4



Data sources

Jacobs 2015

LPI 2015

RMS 2013 (W2B Alliance)

Figure 4-1 | Pre-Development Catchment Boundaries

Table 4-2 Post-development catchment areas

Zone	Area (m ²)
Maximum security correctional centre	233,081.03
Minimum security correctional centre	62,343.01
External areas (car park, access road and stores)	39,920.08
Total impervious area	335,344
Total pervious area	1,620,777 (= pre-development total catchment areas less total impervious area)

4.1.3 OSD summary sheet

Table 4-3 is based on the Council-recommended OSD summary calculation sheet used to determine the require OSD storage volume for the Project.

Table 4-3 OSD calculation table

Calculation	Result
Development area – pre-development	1,956,121 m²
Pre-development catchment areas	
Impervious area	0 m ²
Pervious area	1,956,121 m ²
Total area	1,956,121 m²
Stormwater flows	
Duration	5 min
Rainfall intensity (⁵ I ₅)	159 mm/h
Stormwater flow (Q ₅)	53,565.12 l/s
Post-development catchment areas	
Impervious area	335,344 m ²
Pervious area	1,620,777 m ²
Total area	1,956,121
Stormwater flows	
Duration	5 min
Rainfall intensity (²⁰ I ₅)	200 mm/h
Stormwater flow (Q ₂₀)	72,593.97 l/s
Stormwater detention requirements	
Storage volume	5,708.65 m³
Permissible site discharge (PSD)	53,565.12 l/s

Based on the calculations summarised in **Table 4-3**, the estimated OSD storage volume required for the Project is approximately 5,709 m³. The OSD storage volume can be provided through either above-ground storage basins in landscaped areas or rainwater tanks. The actual OSD storage volume for the facilities would need to be confirmed in the next stage of the development.

4.2 Electrical

4.2.1 Demand calculation

The estimated electricity maximum demand for the Project is approximately 15 MVA. The electrical demand calculation is outlined in **Table 4-4** and is based on information gathered from a comparable correctional facility installation. Since no natural gas is available to the site, all power requirements would be provided via electricity, including heating and domestic hot water services and accordingly the calculation has assumed that there will be no natural gas available.

Table 4-4 Electrical demand load calculation

Item	Maximum demand estimate	Comments
1700 bed facility (excluding cooling)	4000 kW	Prorated and calculated on the basis of a 1300 bed facility requiring 3060kW
Domestic hot water (with 80% diversity)	4750 kW	-
Central heating from the Central Utility Plant (CUP)	3000 kW	-
Local radiant gas heating in a number of buildings, such as industry, kitchen/laundry, external stores, multipurpose hall	2000 kW	From Liquefied Petroleum Gas (LPG) tank supply
Kitchen equipment	N/A	From Liquefied Petroleum Gas (LPG) tank supply
Laundry equipment	N/A	From LPG tank supply
Tri-generation equipment/ Solar	N/A	-
Total electrical load	13750 kW	-
Estimated maximum demand (assuming 0.9 power factor)	15 MVA	-

4.2.2 Servicing strategy

The connection to the electricity network to supply the Project would most likely be via an overhead line and would need to cover a significant distance (approximately 24 kilometres) in order to connect the Project to the nearest zone substation. The Project would also need to have high voltage infrastructure within the facility and step down transformers to supply the 415 V mains supply. This is the most efficient method for transferring large electrical loads over distance.

Two preliminary options have been identified for routing the transmission line from the zone substation to the Project Site boundary. The first option would entail constructing the transmission line within the road reserves for the local road network with Clarence Valley Council's consent. The second option would be to build the transmission line across private property from the substation to the Project, with the creation of an easement on the affected private land. The latter would require negotiation with and potential compensation for the affected land owners. However, the second option is likely to be the most cost-efficient as it would facilitate the most direct and hence shortest alignment. Final consideration should be made in consultation with Clarence Valley Council who would be able to provide advice on road safety issues with regard to the use of road reserves and potentially affected landowners.

Essential Energy is likely to supply the development connection point from the nearest zone substation, located at Koolkhan, and provide the Project with a dedicated electrical feed. The installation would require the design and construction of the Project to be completed and application made under a separate planning pathway.

4.3 Telecommunications

Jacobs have initiated consultation with the National Broadband Network (NBN) to confirm what communication infrastructure would be provided to service the Project. NBN have advised it is not in the position to provide any connection advice at this point in time, and advised that discussions should be held with Telstra regarding communication servicing options for the Project.

An application has been lodged with the Telstra Development Liaison Department and Jacobs has been informally notified that the extant copper cable which currently passes in close proximity to the Project Site is for residential purposes only and would not have the capability to service the Project. Telstra have advised that the existing fibre optic cable located in the vicinity of the Clarence Valley Regional Airport may be able to provide communication services to the Project. Due to the distance from the existing fibre optic cable to the Project, a new fibre optic cable would need to be installed to link the Project to the connection point.

The Federal Government has recently released a new policy for telecommunications infrastructure in new developments. This policy involves a maximum notice period of six months for new developments. The purpose of the notice period is to allow time for NBN to make announcements and build network infrastructure, which may have an impact on infrastructure responsibility.

In addition, Telstra's agreements with NBN include a requirement to transfer ownership of certain network elements as NBN areas become Ready for Service.

In light of recent changes to policy and infrastructure ownership, Telstra were unable to confirm whether it would be able to install telecommunications infrastructure to service the Project until closer to the build date. Telstra have advised that it is assumed that if the infrastructure has been transferred to NBN, NBN would be able to assist with the installation of the requisite connection.

5. Conclusion

The Project Site currently consists of mainly grassland with small cluster of trees scatter across the site. The site generally falls in an east and west direction towards existing creeks.

Utilities services infrastructure in the vicinity of the Project Site is limited, with the only extant infrastructure including Telstra communications conduits and aerial electrical cables. No gas infrastructure is located in the vicinity of the site or in the greater Grafton area.

Under the current Council stormwater requirement, the Project requires approximately 5,709 m³ of OSD storage volume. This requirement is to ensure post-development stormwater flow does not exceed the pre-development flow. The OSD can be provided in stages depending on timing of the development of the future facilities.

Based on the concept proposal, the estimated electrical maximum demand for the Project is around 15 MVA. For efficiency in transferring large electrical loads, the common expected method of supply to the Project is to provide electrical supply with high voltage infrastructure and distribute the electrical supply within the Project using step-down transformers with 415 V main supply. Once the Stage 2 design is complete, Essential Energy is likely to supply the development connection point from the nearest zone substation and provide the Project with a dedicated electrical feed. The extension to the electricity network to facilitate supply to the Project would need to be run a significant distance as the most likely suitable connection point would be a the nearest zone substation and overhead line would be run through to the Project Site.

Telstra have advised that an existing fibre optic cable is located in the vicinity of the Clarence Valley Regional Airport and it may possible to provide communication services to the Project. However, the existing fibre optic cables are located approximately three kilometres from the site and would require a fibre optic link from the connection point to the Project Site. Telstra also advised that it would not be able to confirm whether it would be able to install telecommunications infrastructure to service the Project until closer to the initiation of the development, due to recent changes in policy and in infrastructure ownership.

This report has provided a review of the existing utilities and services (excluding wastewater and water supply) in the vicinity of the Project Site. The augmentation requirements for the development of stormwater, electrical and telecommunication infrastructure have been outlined in this report. This report also addresses the on-site detention requirements for the Project as appropriate for information available regarding the final design at this stage of the Project. In doing this, this report has met SEAR No 12 and 14 as outlined in **Table 1-3**.

6. References

Northern Rivers Local Government (2006). *Guidelines for Development and Subdivision of Land*.

Northern Rivers Local Government (2013). *Handbook of Stormwater Drainage Design*.

Northern Rivers Local Government (2013). *Development Design Specification D5 Stormwater Drainage Design*.

Appendix C. Water Cycle Management Plan Working Paper

New Grafton Correctional Centre

Infrastructure New South Wales

Water Cycle Management Plan Working Paper

Final | V6

1 August 2016



New Grafton Correctional Centre

Project No: IA101200
Document Title: Water Cycle Management Working Paper
Document No.: Final
Revision: V06
Date: 1 August 2016
Client Name: Infrastructure New South Wales
Client No: NGCC EIS Support
Project Manager: Rachel Vazey
Author: Russell Beatty
File Name: \\Jacobs.com\ANZ\IE\Projects\04_Eastern\IA101200\02 Documents_Final
Report_20160801\ToIssue\IA101200_NGCC_Water Cycle Management_Revised
Final_20160801_ToIssue.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
Draft	29/02/2016	Practice Review	Russell Beatty	Nicola Logan	Rachel Vazey
Final	22/03/2016	Final	Russell Beatty	Caitlin Bennett	Rachel Vazey
Revised Final	20/05/2016	Updated to include revised project description	Andrew Spinks	Rachel Vazey	Andrew Spinks
Revised Final	22/06/2016	Updated to include revised project description	Rachel Vazey	Andrew Spinks	Rachel Vazey
Revised Final	07/07/2016	Updated to include revised project description	Rachel Vazey	Rachel Vazey	Rachel Vazey
Revised Final	01/08/2016	Updated to include revised project description	Rachel Vazey	Rachel Vazey	Rachel Vazey

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Terms and acronym used in this document

Acronym	Definition
CSNSW	Correctional Services New South Wales
DECC	Department of Environment and Climate Change
DPE	Department of Planning and the Environment
DPI	Department of Primary Industries
EIS	Environmental Impact Statement
ESD	Ecological Sustainable Development
GFA	Gross Floor Area
INSW	Infrastructure NSW.
LGA	Local government area.
NGCC	New Grafton Correctional Centre.
NOW	NSW Office of Water
NSW	New South Wales
OEH	Office of Environment and Heritage
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	Comprised 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 development application.
SEARS	Secretary's Environment Assessment Requirements.
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011.</i>
SSD	State Significant Development.
USA	United State of America
WSUD	Water Sensitive Urban Design

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 (DA) for the New Grafton Correctional Centre (the Project). The Project will be located on a 195 hectare site (the Project Site), at 313 Avenue Road, Lavadia, approximately 12.5 kilometres (km) south-east of Grafton within the Clarence Valley Local Government Area. The Project would consist of a 1,700 bed maximum security correctional centre, a 400 bed minimum security correctional centre and relevant support services and facilities. The concept proposal and the Stage 1 works application comprise the Proposal.

This working paper is an assessment of water cycle management associated with operation of the Project. The strategy for water cycle management considers operation of a 1,700 bed facility with 600 to 650 support staff and up to 50 visitors attending site daily. The preparation of the water cycle management strategy involves considering all sources of water and all uses of water in a total catchment context. This includes the consideration of water supply, wastewater collection and treatment and stormwater.

With the location of the Project some distance from the nearest urban centre (Grafton), there is potentially a need to import water and export wastewater from the site over considerable distances. In addition, the Project is a relatively intense, semi-urban development which can generate a number of adverse water cycle outcomes including the generation of significant volumes of polluted and nutrient-laden wastewater and stormwater.

In current best practice water cycle management, it is appropriate to examine each of these impacts and examine a range of water cycle management options before arriving at a preferred water cycle management strategy. The water cycle management strategy focusses primarily on water balance rather than water quality outcomes. Water quality outcomes for stormwater would be considered in the *Stormwater Management Strategy* prepared as part of the Stage 2 Development Application. Water cycle management options considered a range of options for conserving water and utilising recycled wastewater or stormwater and roof water as alternative sources for meeting demand.

The assessment considered three possible scenarios with different configurations of recycled wastewater and roof water use. Water balance outcomes were simulated using Jacobs IWMSim model. With the goals of minimising the import and export of water to and from the site, the harvesting of stormwater was not considered in the scenarios due to a preference to use recycled wastewater (thus minimising discharge) and roof water (being a higher quality than stormwater thus more suitable for a wider range of uses).

The three scenarios were:

- 1) A base case, which assumed a business as usual approach.
- 2) The use of recycled wastewater for cooling towers and irrigation and roof water for toilet and urinal flushing
 - Reducing potable demand by 40 per cent (%)
 - Reducing wastewater discharges by 31%.
- 3) The use of recycled wastewater for cooling towers, irrigation and toilet and urinal flushing and roof water for all other uses.
 - Reducing potable demand by 69%
 - Reducing wastewater discharges by 47%.

With a basic level of runoff water quality control, filtration and disinfection, harvested roof water would be an ideal source of water including for potable water uses. In both scenarios any shortfall in roof water was topped up from the potable supply system.

With the long distances involved for the supply of water and the need for the minimisation of potential wastewater discharge from site, it makes sense to select a water cycle management approach that makes as much use as possible of water generated at the Project. Recycled wastewater and harvested roof water are

ideally suited for a variety of fit of purpose uses on site. For this reason, Scenario 3 is the preferred water cycle management scenario for the site. By reusing water on site the proposal also helps to fulfil some of the requirements under the Secretary's Environment Assessment Requirements (SEARs) No 9 issued for the Project in regards to implementing Ecological Sustainable Development (ESD) principles as part of the design of the Project.

1. Introduction

1.1 Background

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 (DA) for the New Grafton Correctional Centre (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.

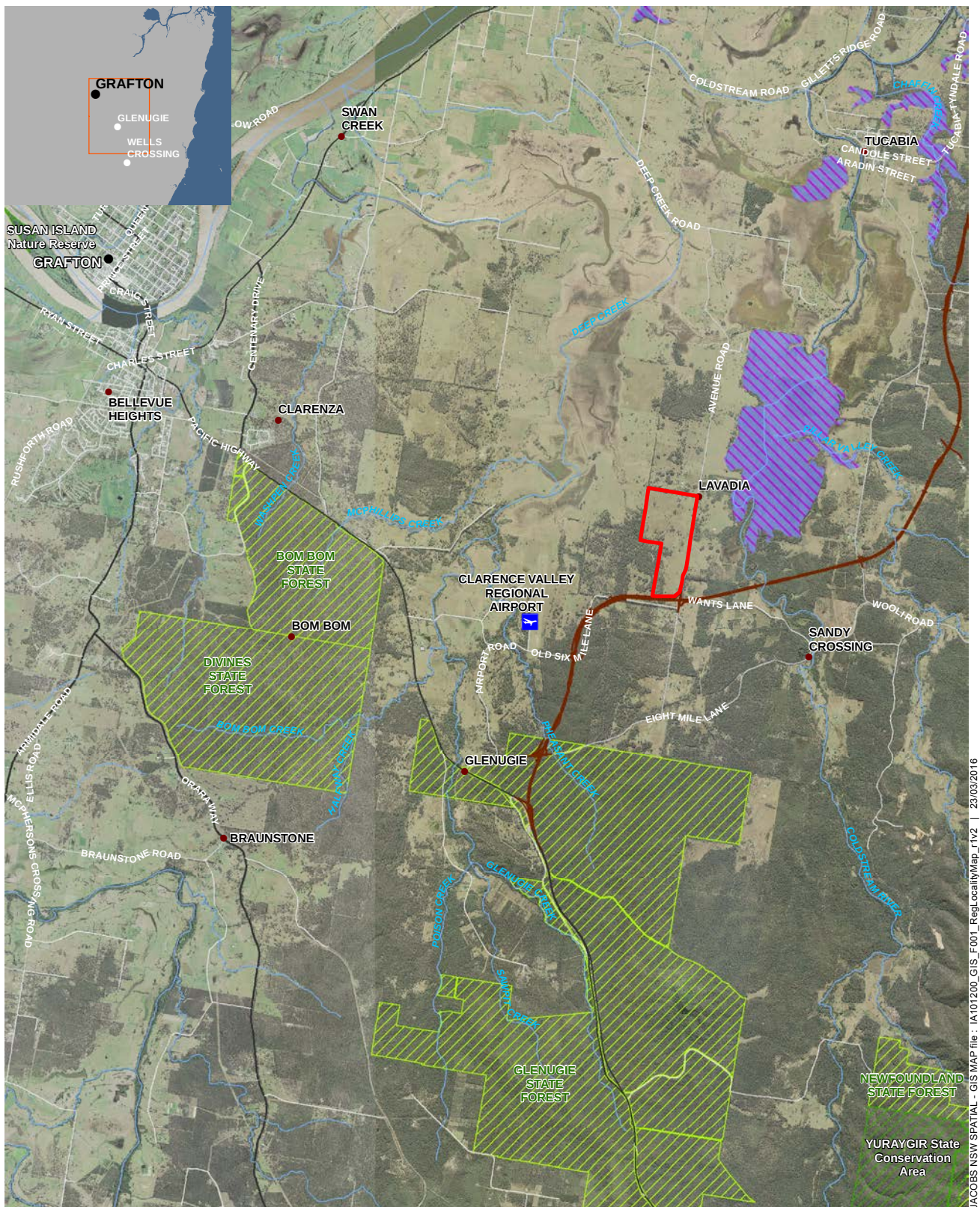
The Project Site includes two properties comprised of Lot 26 DP 751376 and Lot 1 DP 1190399 and is 195 hectares in size; refer to **Figure 1-2**. The site has historically been used for cattle grazing. In July 2015, development consent for a dwelling house in the southeast corner of Lot 1 DP 1190399 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 Lane, 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.

Table 1-1 provides a summary of the Proposal's key components and features.



JACOBS NSW SPATIAL - GIS MAP file: IA101200_GIS_F001_RegionalLocalityMap_r1v2 | 23/03/2016

Legend

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

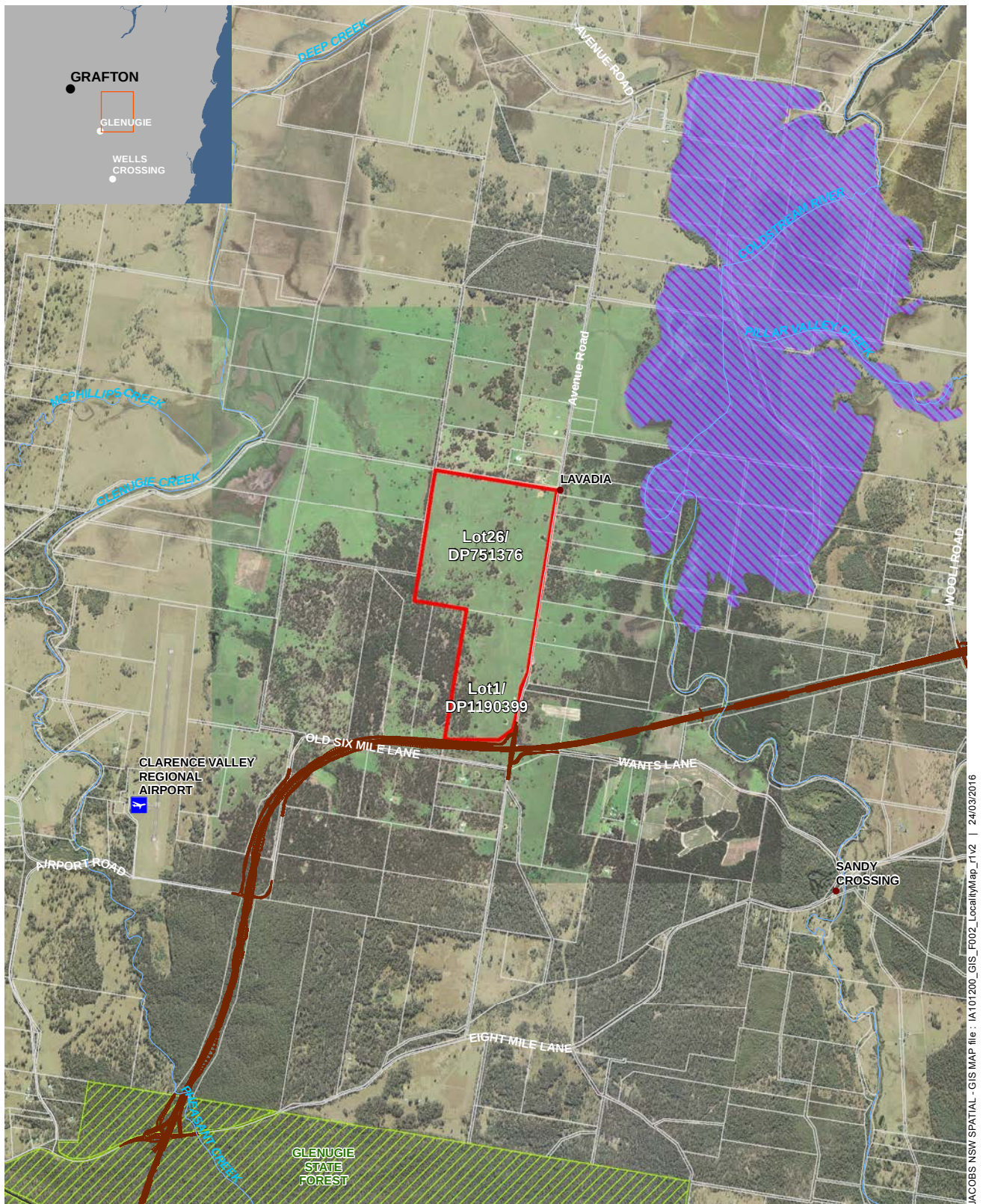
0 2 4 Km
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Data sources

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

Figure 1-1 | Regional Locality



Legend

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

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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 is 195 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.

1.4 Project objectives

The objectives of the Project are:

- 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.



JACOBS NSW SPATIAL - GIS MAP file : IA101200_GIS_F003_Project_r3v2 | 20/06/2016

Legend

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

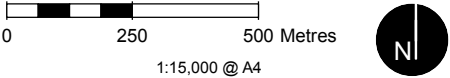


Figure 1-3 | The Project

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

1.5 Report structure

This is the Water Cycle Management Working Paper that will support the EIS required for the Proposal under Division 4.1, Part 4 of the EP&A Act. The structure of the report is summarised in **Table 1-2**. SEARs relevant to this specialist 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	Description of the project and provides an overview of the study objectives and structure of technical report.
2	Assessment requirements	Sets out the drivers for the work undertaken in the development of the water cycle management strategy
3	Water cycle management strategy development	Provides an overview of the approach, outlines the key assumptions, the process of the development of the strategy and provides the water balance modelling results.
4	References	
5	Terms and acronyms used in the document	

Table 1-3 Summary of SEARs relevant to this working paper

SEARs	Cross reference
SEARS No 9 - ESD Detail how Ecological Sustainable Development (ESD) principles (as defined in clause 7(4) of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i>) will be incorporated in the design, construction and on-going operation phases of the development. Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy.	This entire working paper addresses part of SEARS No 9 by reviewing water cycle management strategies and consideration of recycling water as part of the operational phase of the project implementation. Other ESD principles such as consumption of resources and energy will be considered as part of the EIS being prepared for the Project.

2. Assessment requirements

The strategy for water cycle management considers operation of a 1,700 bed facility with 600 to 650 support staff and up to 50 visitors per day for up to a four hour period. The development of a strategy for water cycle management for a new development requires the consideration of all sources of water and all uses of water in a total catchment context. As such a water cycle management strategy will consider the management of the three streams of the water cycle:

- Water supply.
- Wastewater collection and treatment.
- Stormwater.

In considering a new development such as the Project, there are no specific legislative or regulatory requirements that relate to the water cycle management strategy, although there are requirements that relate to the development of infrastructure in each of the three water streams above. Thus this working paper will not be considering any specific requirements.

It is however understood that any modification of land use through development will have a number of adverse environmental impacts relating to the water cycle. For the Project which is a relatively intense, semi-urban development these are:

- The concentrated demand for water leads to the requirement to import water onto the site.
- The concentrated point-source generation of wastewater leads to highly polluted and nutrient-laden volumes of water that is unsuitable for discharge to the environment without treatment.
- The coverage of the site with significant amounts of impervious surface, some of which are roadways, results in:
 - Reduces natural infiltration to soils and groundwater.
 - Increases the volume and intensity of stormwater runoff.
 - Increases the pollutant and nutrient content.

In current best practice water cycle management, it is appropriate to examine each of these impacts and examine a range of water cycle management options before arriving at a preferred water cycle management strategy. This aligns with the consideration of ESD principles outlined in SEARs No.9 in **Table 1-3** above.

3. Water cycle management strategy development

3.1 Overview of Approach

3.1.1 Catchment context

The site is located on a series of ridges on Avenue Road around 12.5 km east of Grafton. The location of the Project on the ridge line creates two separate drainage paths from the site. These are:

- 1) To the northwest – flowing into Glenugie Creek and then ultimately to the Clarence River.
- 2) To the northeast – flowing into the Coldstream River and then into the Clarence River.

3.1.2 Options considered

In the development of a water cycle management strategy, there are a range of options that are considered. These are set out in **Table 3-1** below. Part of that strategy is to conserve water, part is to recycle or use alternative sources of water and the third is to maximise the treatment of stormwater at source.

In considering these options, some options, such as Water Sensitive Urban Design (WSUD) and the use of green roofs, will need to be considered at the design stage and as part of the *Stormwater Quality Management Strategy*.

Table 3-1 List of Potential Water Cycle Management Options

Water Cycle Management Option	Target Issue	Other Benefits	Potential Limitations	Coverage in this Working Paper
Water efficient fixtures and appliances	Reducing water use	- Reduces water and energy (hot water and water pumping) usage - Reduces the need for water system amplification	None	Yes
Waterless Urinals	Reducing water use	- Reduces water and energy (water pumping) usage - Reduces the need for water system amplification	Maintenance	Yes
Recycled wastewater for non-potable uses: - Cooling towers - Toilet/urinal flushing - Irrigation	Reducing water use	Reduces discharges to environment	Cost and footprint for on-site wastewater treatment facilities	Yes
Roof water harvesting	Reducing water use	- Large roof areas available - Improves stormwater quality - Reduces stormwater runoff	- Space for location of storages - Limited roof area	Yes

Water Cycle Management Option	Target Issue	Other Benefits	Potential Limitations	Coverage in this Working Paper
Stormwater harvesting	Reducing water use	- Large impervious areas available - Reduces stormwater runoff - Improves stormwater quality	- Limited storage space on site - Competes for demand with recycled wastewater, which is a higher priority due to the need to limit wastewater discharge from site	Yes
Green Roofs	Improving stormwater quality	Mitigates urban heat island effect	- Maintenance - Interaction with roof-top solar systems - Cannot be used on power station	No. This would be considered at building design stage
Engineered wetlands	Improving stormwater quality	- Mitigates urban heat island effect - Improves public open space and amenity	Land area required	No. This would be considered in Stormwater Management Strategy prepared as part of the Stage 2 Development Application
At-source WSUD: - Drainage swales - Biofiltration swales - Infiltration trenches - Permeable pavings - Gross Pollutant Traps	Improving stormwater quality	- Improves stormwater quality - Reduces stormwater runoff - Mitigating heat island effect from roads and buildings	- Cost - Additional land area	No This would be considered in Stormwater Management Strategy prepared as part of the Stage 2 Development Application

3.1.3 Water balance modelling approach

To undertake the water balance comparison the Jacobs IWMSim model (an integrated water cycle water balance model) was used. The model:

- 1) Is designed to simulate the operation of all parts of an integrated water system including water demands (seasonal and non-seasonal), wastewater flows (dry weather and wet weather) and stormwater flows.
- 2) Utilises actual water and wastewater system data to generate demands and flows, so that the supply and demand patterns so critical to understanding urban water balances are precisely simulated.
- 3) Uses a unique Monte-Carlo simulation of large numbers of virtual water uses. Each group of users has specified “end-uses” of water that can be supplied from either the potable supply, rainwater, recycled

wastewater or recycled stormwater. Each virtual user exhibits individual probabilistic behaviour driven by varying water use behaviour.

Stormwater flows are generated within IWMSim using the SimHyd hydrological model. The overall structure of the model is shown in **Figure 3-1**.

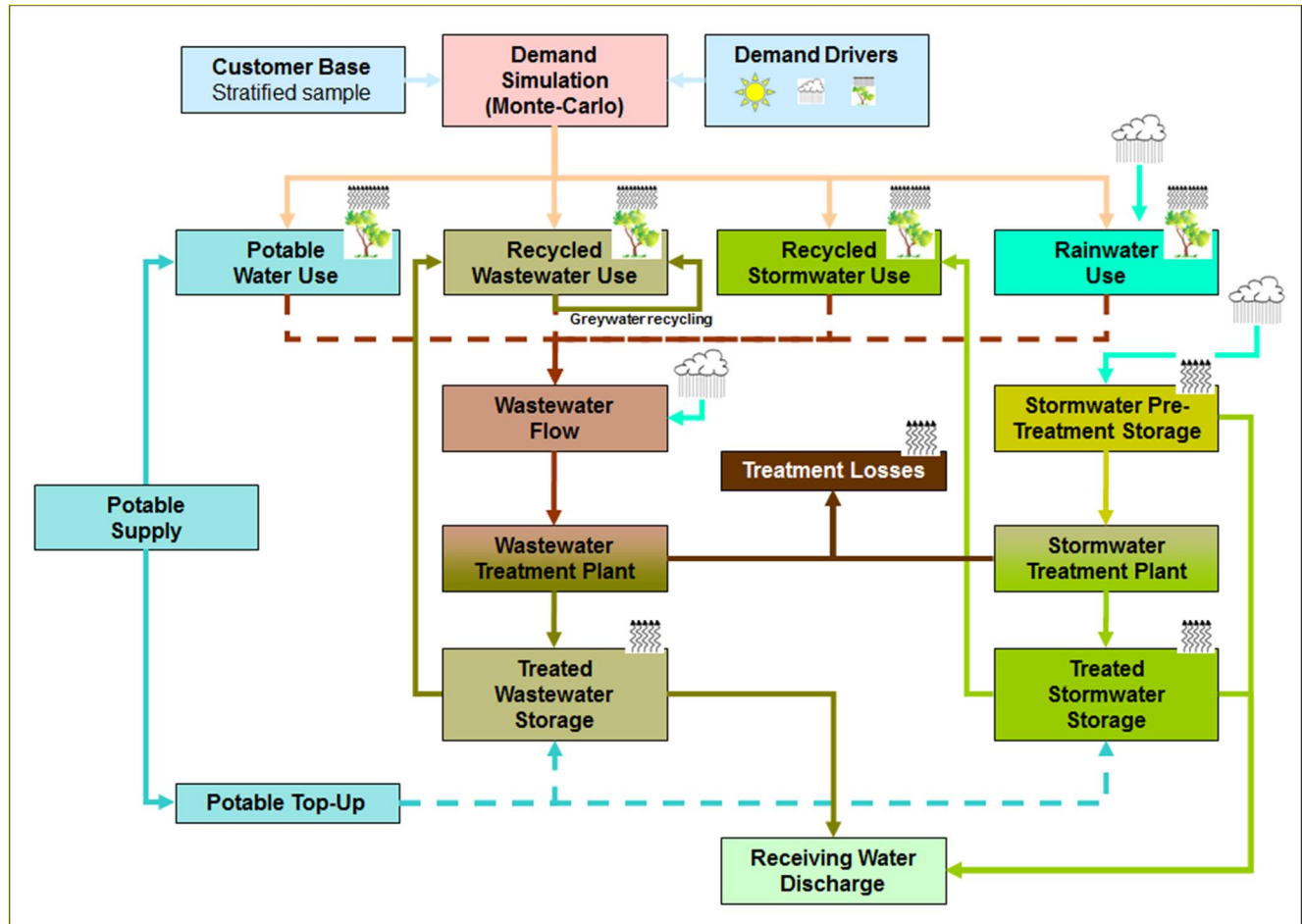


Figure 3-1 IWMSim model structure

Water uses in the model are divided into those generating wastewater flows, and those not. Each water use is assigned a climate-driven demand pattern. The parameters governing the climate-driven variations in demands were derived from the analysis of daily bulk water demand records in typical Australian urban areas. Two climate-driven demand profiles were used:

- 1) Irrigation (driven by soil moisture and antecedent rainfall).
- 2) Evaporative cooling (driven by the average maximum daily temperature).

3.2 Key assumptions

As mentioned above, the development of a water cycle requires the consideration of all sources and uses of water. To do this, estimates of different water end uses are required. Unfortunately, there is little in the way of end use water data available from Australian correctional centres. There is however, useful information on the benchmarking on water use such centres (refer to **Table 3-2**).

Table 3-2 Comparison of Water Consumption in Correctional Centres (Sevineratne, 2007)

Water usage	Australia (NSW)	USA	United Kingdom
Typical water usage (m ³ /inmate/day)	0.32-1.29	0.3-0.57	0.32-0.39

To generate water use from the correctional centre, five steps were used:

- 1) Inmate use was assumed to be two times the level of typical water use in residential Australian dwellings (with the same end uses of water).
- 2) Staff and visitor water use was generated by:
 - i. Estimating a Gross Floor Area (GFA) for accommodating the staff and visitors based on NSW government office design requirements (State Property Authority, 2010).
 - ii. Applying benchmark water uses for commercial office space per unit GFA.
- 3) Apply benchmark cooling tower water use per GFA over the site by multiplying the roof area over the whole site by two floors.
- 4) Applying benchmark water use for irrigation water use over two hectares of assumed playing field irrigation.

The water balance modelling was based on the ultimate development for the site.

Water balance assumptions are outlined in **Table 3-3** below.

Table 3-3 Water Balance Modelling Assumptions

Parameter	Value Used
Total Roof Area	104,440 m ²
Number of Inmates	1,700
Number of Staff and Visitors	650
Average Daily Water use Per Inmate	397 L/d
Cooling Tower Use per GFA	0.57 L/d/m ²
Staff and visitor water use per GFA	0.57 L/d/m ²
Staff and visitor water unit GFA	15 m ² /person
Area of playing field irrigation	2 Ha
Average playing field application rate	10 mm/m ² /week

Water use breakdowns for inmates and staff/visitors are provided in **Figure 3-2** and **Figure 3-3**. These breakdowns were adapted from studies into the residential (Yarra Valley Water, 2004) and commercial (American Water Works Association Research Foundation, 2000) end uses of water.

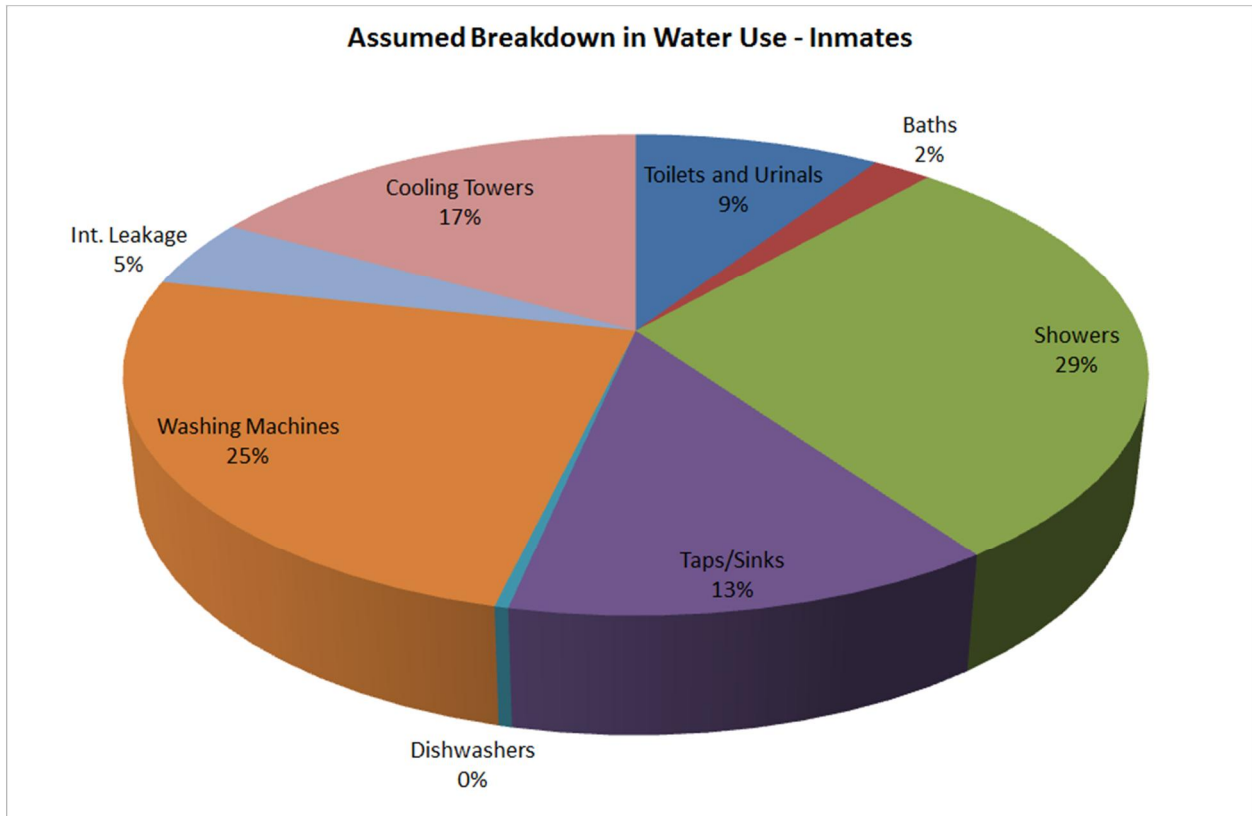


Figure 3-2 Assumed Breakdown in Water Use – Inmates

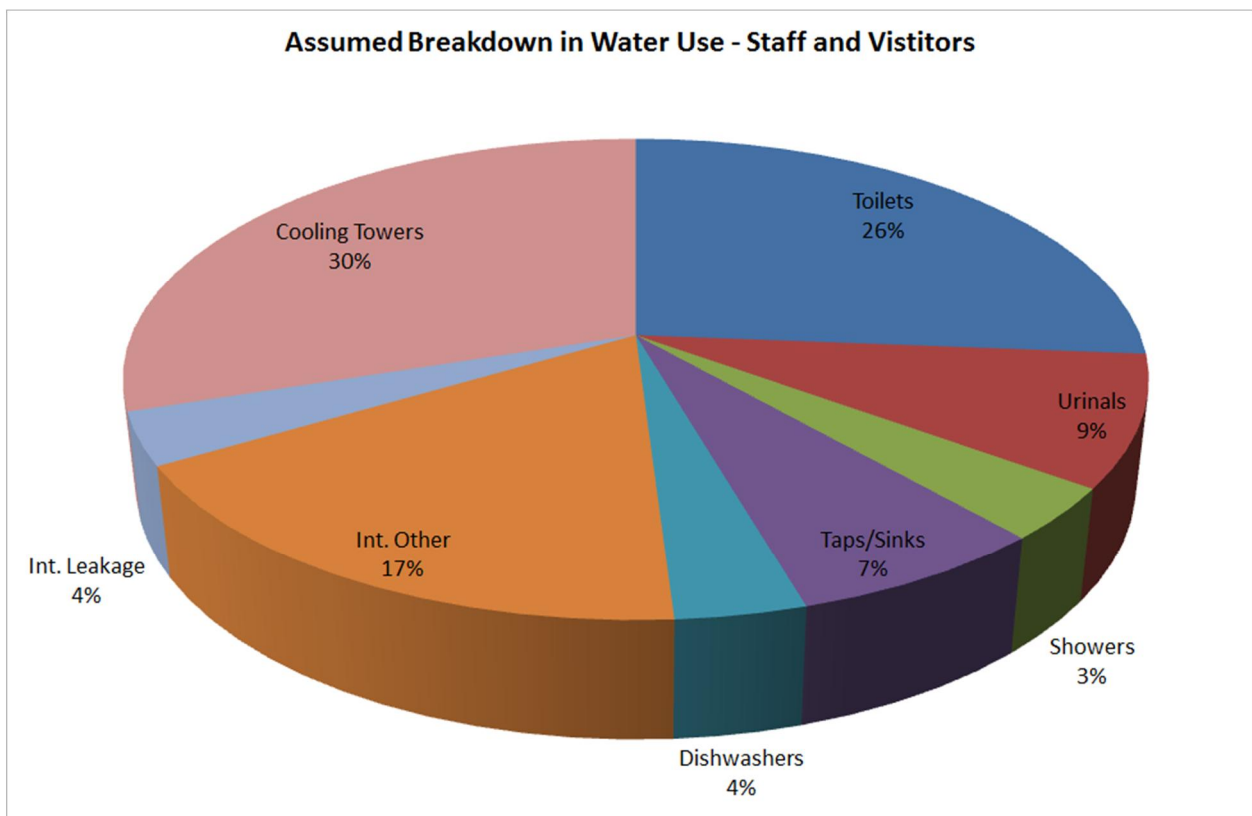


Figure 3-3 Assumed Breakdown in Water Use – Staff and Visitors

3.3 The development of water cycle management scenarios

The list of potential water cycle management options considered in the water balance modelling are shown in **Table 3-4**. In considering alternative water sources to potable water, the supply of recycled stormwater was considered, however as there is a need to minimise wastewater discharges from the site and that there is anticipated to be an excess of wastewater, recycled wastewater was seen to be the preferred alternative water source for non-potable uses. With a basic level of runoff water quality control, filtration and disinfection, harvested roof water would be an ideal source of water including for potable water uses.

It should be noted that while recycled water use is considered for building and playing field use, the potential broad acre irrigation over the large areas of the site as a measure to further reduce wastewater discharges is considered in the Wastewater Servicing Strategy working paper.

Table 3-4 List of Potential Water Cycle Management Options

Water Cycle Management Option	Scenario 1 – Business as Usual – Traditional Development	Scenario 2 – Concurrent Rainwater and Recycled Wastewater Recycling	Scenario 3 – Maximised Rainwater and Recycled Wastewater Harvesting	Notes
Water efficient fixtures and appliances	No	Yes	Yes	Standard approach in modern building design
Waterless Urinals	No	No	No	Not specifically considered – may be part of a package of more water efficient fixtures and appliances.
Recycled wastewater	No	Yes: · Cooling towers · Irrigation	Yes: · Cooling towers · Toilet/urinal flushing · Irrigation	Preferred over stormwater harvesting due to the need to reduce wastewater discharges from site
Roof water harvesting	No	Yes: · Toilet and urinal flushing	Yes · All other uses · Hot water system uses	Preferred over stormwater harvesting due to better water quality and reduced need for treatment.
Stormwater harvesting	No	No	No	Stormwater harvesting not included in scenarios due to better sources of water being available: · Roof water. · Recycled wastewater

3.4 Water cycle outcomes and preferred option

Water balance outcomes were modelled using the IWMSim model outlined above. Summary results are provided in **Table 3-5** below. Scenario 3 is the preferred approach due to its maximisation of recycled wastewater use on site and the minimisation of the need for imported potable water.

Table 3-5 Water Cycle Water Balance Outcomes

Parameter	Scenario 1 - Base Case: Traditional Development	Scenario 2 - Concurrent Rainwater and Recycled Wastewater Recycling	Scenario 3 - Maximised Rainwater and Recycled Wastewater Harvesting
Potable Water Demands			
Average Day Potable Water Demand (ML/d)	0.76	0.46	0.23
Peak Day Potable Water Demand (ML/d)	1.13	0.76	0.65
% Reduction in Potable Water Demand	N/A	40%	69%
Wastewater Flows			
Average Day Wastewater Flows (ML/d)	0.59	0.59	0.59
Peak Day Wastewater Flow (ML/d)	0.76	0.76	0.76
Average Wastewater Discharge (ML/d)	0.59	0.40	0.31
Peak Wastewater Discharge (ML/d)	0.76	0.65	0.51
% Reduction in Wastewater Discharge	N/A	31%	47%
Rainwater System Demand			
Average Day Rainwater Demand (ML/d)	N/A	0.25	0.49
Peak Day Rainwater Demand (ML/d)	N/A	0.32	0.63
Rainwater Storage Size (kL)	N/A	1,261	2,446
Reliability of Rainwater Supply		62%	60%
Recycled Water System Demand			
Average Day Recycled Water System Demand (ML/d)	N/A	0.16	0.24
Peak Day Recycled Water System Demand (ML/d)	N/A	0.49	0.55

3.5 Conclusions

With the long distances involved for the supply of water and the need for the minimisation of potential wastewater discharge from site, it makes sense to select a water cycle management approach that makes as much use as possible of water generated at the Project. Recycled wastewater and harvested roof water are ideally suited for a variety of fit of purpose uses on site. For this reason, Scenario 3 is the preferred water cycle management scenario for the site. By reusing water on site the proposal also helps to fulfil some of the requirements under the SEARs No 9 (**Table 1-3**) in regards to implementing ESD principles as part of the design of the Project.

4. References

- American Water Works Association Research Foundation. (2000). *Commercial and Institutional End Uses of Water*.
- Sevineratne, M. (2007). *A Practical Approach to Water Conservation for Commercial and Industrial Facilities*. Queensland Water Commission.
- State Property Authority. (2010). *NSW Government Office Design Requirements*.
- Yarra Valley Water. (2004). *Residential End Use Measurement Study*.