DOMA

FINAL

Canberra Brickworks Precinct

ENVIRONMENTAL IMPACT ASSESSMENT

Yarralumla, ACT

February 2023

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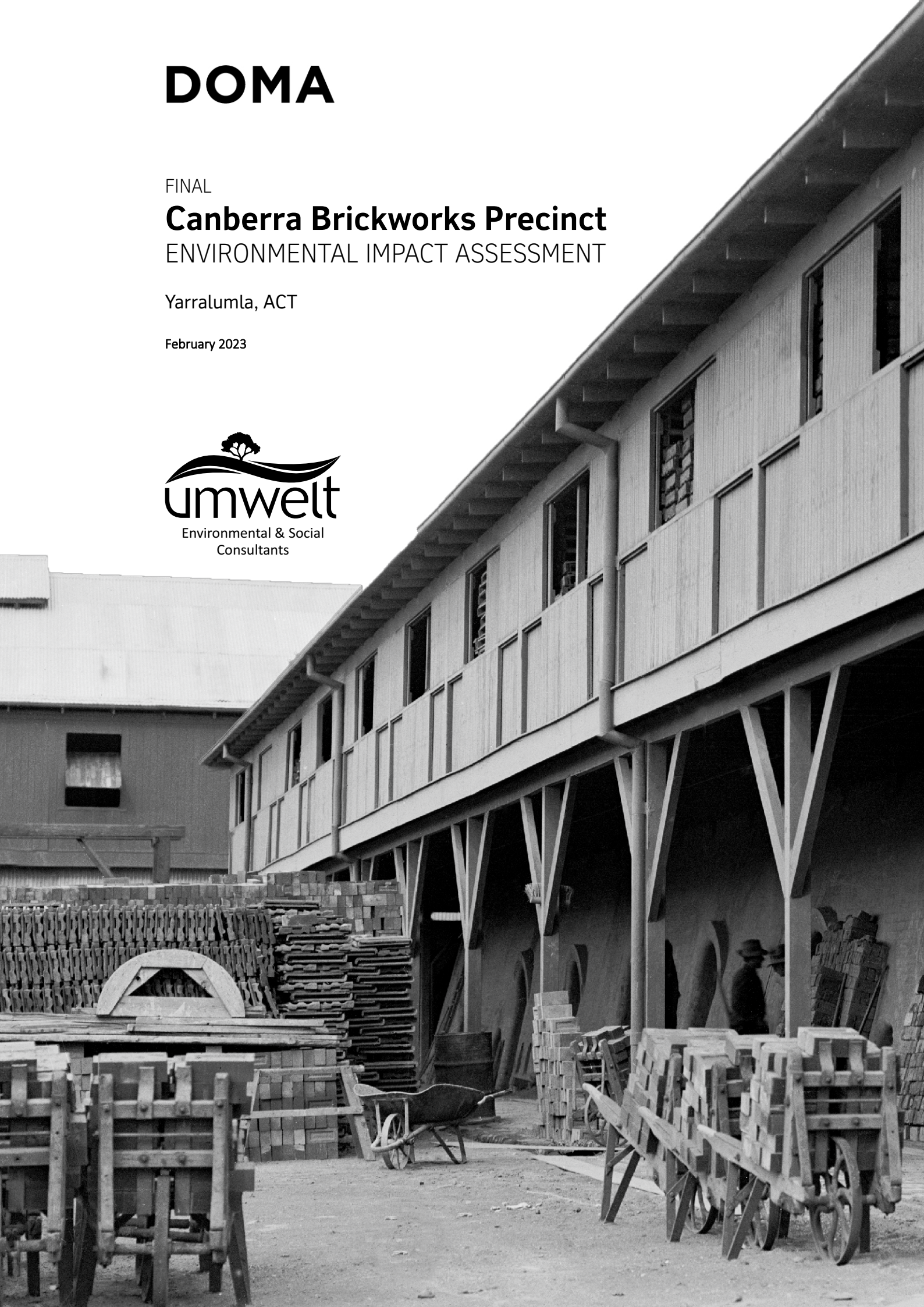
Environmental & Social
Consultants



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CANBERRA BRICKWORKS PRECINCT REDEVELOPMENT

Revised Environmental Impact Statement

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Doma Group

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Document Status

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	Name	Date	Name	Date
1	Caitlin Adcock	10 May 2022	Karina Carwardine	10 May 2022
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5	Lucinda Burchfield	3 February 2023	Karina Carwardine	3 February 2023

Executive Summary

Overview

This submission to the Australian Capital Territory (ACT) Environment, Planning and Sustainable Development Directorate (EPSDD) comprises an Environmental Impact Statement (EIS) under the Bilateral Agreement between the Commonwealth Government and the ACT Government, made under s. 45 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Bilateral Agreement allows for the accreditation of ACT processes (listed in Schedule 1 of the Bilateral Agreement) to provide an integrated and coordinated approach to the assessment of actions requiring approval from both the Commonwealth Minister (under the EPBC Act) and the ACT Minister (under the ACT *Planning and Development Act 2007* (PD Act)).

The EIS relates to the redevelopment and adaptive reuse of the Canberra Brickworks Precinct (CBP) in Yarralumla ACT, proposed to be undertaken by Doma ('the Proponent'). The proposed redevelopment would consist of 380 dwellings, being a mixture of detached houses, townhouses and apartments; adaptive reuse of the existing heritage Brickworks buildings for commercial and retail purposes; and provision of recreational open space and landscaping ('the Proposal'). The Proposal Area is situated on Territory Land located on Blocks 1, 7 and 20, Section 102, in the division of Yarralumla, with an area of 16.09 ha.

A Referral to the Commonwealth Department of the Environment and Energy (DoEE, now the Department of Agriculture, Water and the Environment (DAWE)) was prepared and submitted for the Proposal (EPBC 2017/8078), which was subsequently found to be a 'controlled action' due to potential significant impacts to threatened species, namely golden sun moth (*Synemon plana*). As such, an EIS under the Bilateral Agreement was requested in order for both the Commonwealth and the EPSDD to assess the Proposal.

A Scoping Document Application was submitted on 28 November 2019, with the Scoping Document provided on 16 January 2020. A Draft Environmental Impact Statement (EIS) was submitted to the EPSDD on 3 June 2021. A request for a revised EIS was then issued by the EPSDD on 4 August 2021.

This revised EIS submission is consistent with the EPSDD's guidelines for the preparation of an EIS and addresses issues raised in the Scoping Document while also responding to agency and community submissions made during public exhibition of the draft EIS.

Justification for the Proposal

The EIS considers all applicable legislation and policy in detail. The Proposal is consistent with these statutory requirements and with the strategic policy directions for the ACT. The Proposal is permissible with consent, meets the planning strategy themes of the ACT Planning Strategy 2018 and is compliant with the Yarralumla Neighbourhood Plan.

The locality was chosen having regard for the Walter Burley Griffin's 'City and Environs' plan, which identified Yarralumla as a significant node for the city. The reuse and adaptation of the CBP would realise the Burley Griffin vision for the development node within this locality. Additionally, as urban infill, the Proposal would make more efficient use of existing infrastructure and promote a more compact and sustainable city.

The Proponent is committed to meeting the Green Building Council of Australia (GBCA) requirements to achieve five stars under the Green Star Communities v1.1 rating tool for the Proposal. The Proposal will therefore demonstrate Australian excellence by being a high environmental performer and addressing relevant social issues.

Objectives

The Proposal aims to:

- Celebrate the heritage of the CBP by establishing a viable future use for the Brickworks to ensure its physical conservation.
- Integrate with the landscape by embedding the existing 'garden suburb' landscape character into the design of the streets, parklands, public and private space.
- Provide streets for people by making safe movement of pedestrians and cyclists a priority.
- Provide diversity of housing through innovative housing types to suit the diversity and needs of a growing Canberra.
- Ensure environmental sustainability by creating unique environmentally sustainable development, homes, streets and open spaces.

Options Considered

In 2016, a request for tenders for the redevelopment of the CBP was issued by the ACT Land Development Agency (LDA, now known as the Suburban Land Agency (SLA)), with the Proponent ultimately being selected as the preferred tenderer in April 2017. This was based on the presentation of concept designs for the CBP.

Through extensive community and government agency consultation, the Proponent has made several changes to the proposed masterplan, since being awarded as preferred tenderer. This has included reduced housing density, additional car parking and inner asset protection zones.

Community and Stakeholder Consultation

During the pre-tender process, a Community Panel was established for the Proposal to assist in identifying and incorporating any issues raised by community members and stakeholders at the early concept stage and throughout subsequent design stages of the Proposal. The Proponent has and will continue to engage with the Community Panel and the broader public for this Proposal.

The Proponent has also undertaken regular monthly meetings with the SLA and the ACT Heritage Council, to assist in meeting the requirements of the ACT Government and to ensure the heritage significance of the CBP is appropriately conserved.

The draft EIS was also placed on public exhibition between 8 June and 21 July 2021. Agency and community submissions were received and have been addressed in this revised EIS.

Environmental Impacts

The EIS presents the findings of specialist environmental investigations undertaken for the Proposal, and the potential and likely environmental impacts identified therein. The EIS also sets out the undertakings made by the Proponent to manage and minimise these potential impacts arising from the Proposal. The main environmental impacts associated with the Proposal relate to heritage, ecology, traffic and transport and contamination.

All other impacts, including those associated with noise and lighting, landscape character and visual amenity, property and land use, waste and climate change, are able to be managed through appropriate design responses to be refined through the development application (DA) process, or through the implementation of a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP).

The main impacts of the Proposal are described below.

Aboriginal, European and Natural Heritage

The CBP is located on traditional lands held by the Ngunnawal People. The Proposal Area contains no known Aboriginal places or objects and is considered of low Aboriginal archaeological potential, due to the prior use of the site as a brickworks.

The Canberra Brickworks commenced operation in 1913 and continued production at the Yarralumla site until 1976. The Canberra Brickworks also played a significant role in the development of Canberra, with bricks made at the site used building the construction of Old Parliament House, the Kingston Powerhouse and Hotel Canberra. The 'Yarralumla Brickworks' and the 'Yarralumla Brickworks Railway Remnants' are listed on the ACT Heritage Register.

The brickpits within the Proposal Area are noted within the Statement of Significance for the 'Yarralumla Brickworks', for their historical value as a primary source of clay and also for their considerable geological value. The Proposal Area is one of the few locations in Canberra where the Yarralumla formation (approximately 424 million years old) is easily observed. The formation contains fossil evidence of the last major period when eastern Australia was still covered by shallow seas.

The Proposal seeks to celebrate the heritage of the CBP through its adaptive reuse and interpretation. A Conservation Management Plan (GML, 2021a) has been prepared for the Proposal and will be implemented to best manage and conserve the heritage significance of the site. The heritage and geological significance of the Yarralumla formation would also be preserved and integrated into a public recreational area.

Ecology and Natural Environment

The Proposal would directly impact on 1.58 ha of golden sun moth habitat, within areas of exotic grassland dominated by Chilean needlegrass (*Nassella neesiana*), a weed of national significance. This habitat is considered to be marginal, being located in exotic grassland within a timbered area, and with low connectivity to surrounding habitat. When the Proposal was initially referred, golden sun moth was listed as critically endangered. In December 2021, following the public exhibition of the Draft EIS, it was relisted as a vulnerable species.

Impacts to golden sun moth are proposed to be offset through the purchasing of BioBanking credits under the NSW BioBanking Offset Scheme. The proposed offset site is located in Googong, NSW, approximately 4.5 km from the ACT border, and occurs within the same bioregion as the Proposal Area. This offset area provides a better-quality example of golden sun moth habitat than the impact area and has much higher long-term viability and resilience.

The Proposal would also result in substantial clearing of existing trees within the Proposal Area. The predominant species within the site are the exotic Monterey pine (*Pinus radiata*), Ponderosa pine (*Pinus ponderosa*), Scots pine (*Pinus sylvestris*) and English elm (*Ulmus procera*), as well as other various tree and shrub weed species. These trees were assessed to be in generally poor condition and of low ecological value to arboreal species, such as birds, possums and bats.

The Proposal would include extensive replanting and landscaping across the site to assist in integrating with the surrounding 'tree-lined' suburb of Yarralumla. Replanting of healthy trees would also assist in improving connectivity for transiting arboreal species. Removal of existing trees would be managed through a Flora and Fauna Management Plan, as part of the CEMP.

Traffic and Transport

The Proposal would integrate with Yarralumla's existing road and active travel transport infrastructure. The design of the proposed road network within the CBP would prioritise pedestrian and cyclist access by providing footpath and cycling connections throughout the Proposal Area. Furthermore, vehicles would not be able to drive through the CBP between primary and secondary access points thereby reducing any potential for the Proposal to become a short cut thoroughfare.

The Proposal would provide a total of 1,076 car spaces; exceeding the modelled temporal demand of the CBP once operational. Bicycle parking and Electric Vehicle (EV) parking would also be provided. The Proposal would also allow car sharing services and taxi access into the CBP. This approach seeks to provide adequate access to the Proposal Area, whilst also assisting in achieving sustainable transport outcomes.

During construction, the Proponent is committed to the development and implementation of a Traffic Management Plan to minimise impacts on surrounding residences. Construction access would primarily occur via the new Dudley Street access road and would typically occur outside of peak hours to reduce disruption. Any maintenance required to public roads following construction would be highlighted to Roads ACT, and any damage caused as a direct result of construction would be repaired by the Proponent.

Contamination

The Proposal Area has undergone significant ongoing contamination assessment by both the Proponent and the SLA. During these investigations, 11 Areas of Environmental Concern (AECs) were identified. These AECs do not pose a contamination risk that would preclude the suitability of the site for the proposed redevelopment. The extent of potential contamination within the Proposal Area is considered to be well understood and can be sufficiently remediated and/or managed through implementation of appropriate measures.

Further investigation is proposed through the implementation of the Remediation Works Plan (RWP). Iterative versions of this document have been prepared, along with a Supplementary Environmental Site Assessment (SESA), Site Management Plan (SMP) and Unexpected Finds Protocol (UFP), all of which require approval by the Independent Contaminated Land Auditor and Environment Protection Authority (EPA) prior to construction commencing.

Conclusion

The Proponent recognises that in order to build and manage the Proposal, there would be some changes to the local environment. There would also be some temporary impacts during construction. Such impacts are consistent with similar redevelopment projects and would be managed by applying appropriate and project-specific environmental management measures.

In summary, this EIS has found that the potential environmental impacts associated with the Proposal can be adequately managed and minimised to an acceptable level. The redevelopment of the Canberra Brickworks presents an opportunity for the adaptive reuse and preservation of an important historical site within the ACT.

List of Abbreviations and Acronyms

Abbreviation	Definition
AA	Archaeological Assessment
ACT	Australian Capital Territory
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ALARP	As Low As Reasonably Practicable
ARD	Archaeological Research Design
ARI	Average Recurrence Interval
AS/NZS	Australian Standard/New Zealand Standard
ATSIHP Act	*Aboriginal and Torres Strait Island Heritage Protection Act 1984*
BOP	Bushfire Operations Plan
BRA	Bushfire Risk Assessment
CBD	Central Business District
CBP	Canberra Brickworks Precinct
CCGHGR Act	*Climate Change and Greenhouse Gas Reduction Act 2010*
CDD	Concept Delivery Deed
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CMP	Conservation Management Plan
COPC	Chemicals of Potential Concern
CPTED	Crime Prevention Through Environmental Design
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSM	Conceptual Site Model
CSTM	Canberra Strategic Transport Model
DA	Development Application
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DEWHA	Former Commonwealth Department of Environment, Water, Heritage and the Arts
DoEE	Former Commonwealth Department of Environment and Energy
EIS	Environmental Impact Statement
EISAR	Environmental Impact Statement Assessment Report
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPSDD	Environment, Planning and Sustainable Development Directorate
ESA	Emergency Services Agency
ESD	Ecologically Sustainable Development

Abbreviation	Definition
ESDD	Former ACT Environment and Sustainable Development Directorate
EV	Electric Vehicle
FDH	Fibre Distribution Hub
GAC	Groundwater Acceptance Criteria
GBCA	Green Building Council of Australia
ha	Hectares
HERCON	National Heritage Convention
HIA	Housing Industry Association
HV	High Voltage
IAPZ	Inner Asset Protection Zone
ICOMOS	International Council on Monuments and Sites
IFCW	Infrastructure Finance and Capital Works
ISO	International Organization for Standardization
km	Kilometres
LDA	Land Development Agency
LMPP	Landscape Management Protection Plan
LOR	Limits Of Reporting
MNES	Matters of National Environmental Significance
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NABERS	National Australian Built Environment Rating System
NatHERS	Nationwide House Energy Rating Scheme
NBN	National Broadband Network
NC Act	*Nature Conservation Act 2014*
NCA	National Capital Authority
NCDC	National Capital Development Commission
NCDRP	National Capital Design Review Panel
NCP	National Capital Plan
NEPM	National Environment Protection Measure
NMP	Noise Management Plan
NSW	New South Wales
NT Act	*Native Title Act 1993*
OCMP	Operational Conservation Management Plan
OEMP	Operational Environmental Management Plan
PALM Act	*Australian Capital Territory (Planning and Land Management) Act 1988*
PD Act	*Planning and Development Act 2007*
RAO	Representative Aboriginal Organisations
RFP	Request for Proposal

Abbreviation	Definition
RFT	Request for Tender
RWP	Remediation Works Plan, also referred to as a Remediation Action Plan (RAP)
SAQP	Sampling, Analysis and Quality Plan
SBMP	Strategic Bushfire Management Plan
SESA	Supplementary Environmental Site Assessment
SHE	Statement of Heritage Effects
SLA	Suburban Land Agency
SMP	Site Management Plan
TBL	Triple Bottom Line
TCCS	Transport Canberra and City Services
TIA	Traffic Impact Assessment
TICCIH	The International Committee for the Conservation of Industrial Heritage
UFP	Unexpected Finds Protocol
WoNS	Weed of National Significance
WRMP	Waste and Recycling Management Plan
YRA	Yarralumla Residents Association

Glossary

Term	Definition
Controlled Action (EPBC)	An action defined under the *Environment Protection and Biodiversity Conservation Act 1999,* s.67.
Critically Endangered Ecological Community	An ecosystem that has been identified as critically endangered, as defined in the *Environment Protection and Biodiversity Conservation Act 1999*.
Development Application (DA)	Application for development as defined under the *Planning and Development Act 2007*.
Environment	As defined under the *Planning and Development Act 2007,* each of the following is part of the environment: (a) The soil, atmosphere, water and other parts of the earth; (b) Organic and inorganic matter; (c) Living organisms; (d) Structures, and areas, that are manufactured or modified; (e) Ecosystems and parts of ecosystems, including people and communities; (f) Qualities and characteristics of areas that contribute to their biological diversity, ecological integrity, scientific value, heritage value and amenity; (g) Interactions and interdependencies within and between the things mentioned in paragraphs (a) to (f); (h) Social, aesthetic, cultural and economic characteristics that affect, or are affected by, the things mentioned in paragraphs (a) to (f).
Ecologically Sustainable Development	A form of development that involves using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.
Environmental Impact Statement (EIS)	An investigation of the potential impact of a project on the environment, as defined under the *Planning and Development Act 2007.*
Long term	Greater than 15 years duration.
Medium term	Between three to 15 years duration.
Proponent	The organisation that has put forward the Proposal for development, in this instance, Doma.
Proposal	The Canberra Brickworks Precinct redevelopment, as described in **Section 2.0** of this EIS.
Proposal Area	The area that is the subject of this EIS, as shown in **Figure 1.1.**
Short term	Zero to three years duration.
Targeted Survey	Field survey specifically designed to assess presence/absence and condition of a particular species population and/or community.
Visual amenity	The visual and aesthetic quality of a public or privately owned property.
Weed of National Significance	A type of plant that has been agreed by all Australian governments as being a priority for management based on their invasiveness, potential for spread and environmental, social and economic impacts.

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Appendices

1.0 Introduction to the Proposal

Section Summary
This Section introduces the Proposal, providing its background, objectives and justification against key policies and strategies. Details regarding the Proponent, Doma, are also included within this section.

1.1 Introduction

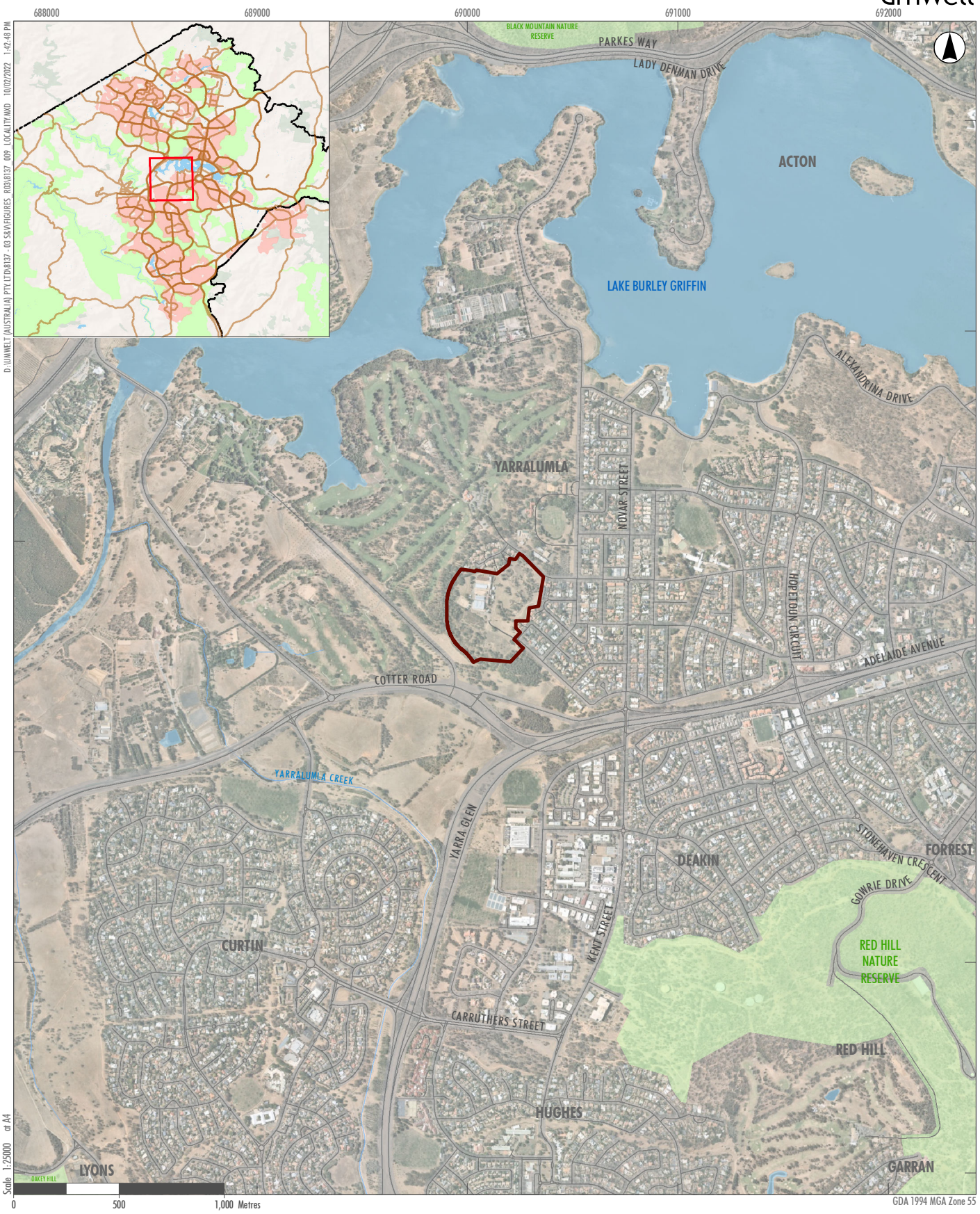
The Canberra Brickworks Precinct (CBP) is located in south-west Yarralumla, Canberra, in the Australian Capital Territory (ACT). It is surrounded by residential development to the north and east, open landscape to the south, and a landscape buffer to the Royal Canberra Golf Club to the west (refer to **Figure 1.1**). The Canberra Brickworks is of heritage significance within the ACT, as one of only three examples of industrial heritage in Canberra. The CBP is approximately 7 km from the Canberra Central Business District (CBD) and 2 km south of Lake Burley Griffin. It is adjacent to Government House, the official residence of the Governor-General of Australia.

The proposed redevelopment would include a maximum of 380 residential dwellings, surrounding re-purposed Canberra Brickworks buildings and recreational parkland. The entire development footprint is approximately 16.09 ha (refer to **Figure 1.2**). The re-purposed heritage buildings will include retail and commercial space, including cafes, health and wellness facilities, and interpretive features focused on the history of the Canberra Brickworks. The CBP is currently accessed via Denman Street in Yarralumla, however construction of a new Dudley Street access road is underway as a separate project.

This Environmental Impact Statement (EIS) presents the findings of specialist environmental investigations associated with the proposed redevelopment of the CBP and proposes avoidance and mitigation measures to address potential environmental impacts. Offsets for some aspects are also identified where compensation for impacts to the environment is necessary and appropriate. This EIS has been prepared under the Bilateral EIS process, with reference to both the ACT *Planning and Development Act 2007* (PD Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Construction of the Proposal is anticipated to occur in late 2022. The Proposal would be delivered through a number of stages and would be expected to be completed by the end of 2025.

Doma Group (Doma) has engaged Umwelt (Australia) Pty Limited (Umwelt) to prepare this EIS following the Application for a Scoping Document for an EIS submitted to the Environment, Planning and Sustainable Development Directorate (EPSDD) for the redevelopment of the CBP (the Proposal). The draft version of this EIS was submitted on 3 June 2021. This revised EIS addresses the issues raised within the Scoping Document and also responds to agency and community submissions received during public exhibition of the draft.



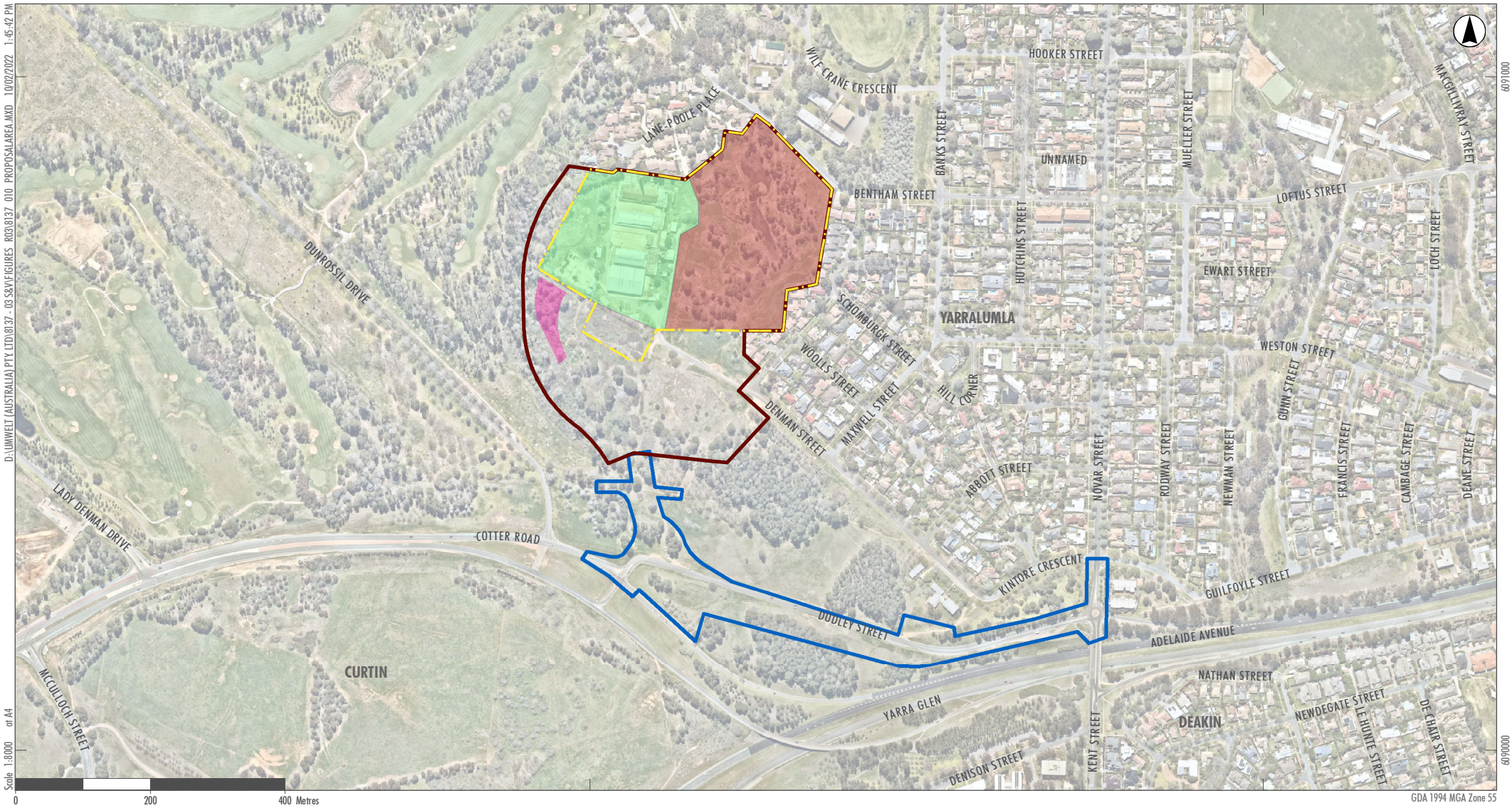
Legend

Proposal Area

FIGURE 1.1

Locality Plan

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory



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Legend

- Proposal Area
- Canberra Brickworks
- Former Quarry or Brick Pit
- Railway Remnants
- Brickworks Heritage Core
- Associated Project - Dudley Street Upgrade & Proposed Access Road

FIGURE 1.2

Proposal Area

Image Source: Nearmap (Sep 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory

1.2 Background

The Canberra Brickworks commenced operation in 1913 and continued production at the Yarralumla site until 1976. During its time at Yarralumla, production at the facility varied according to demand and broader economic and social circumstances, including brief periods of closure during the Depression and World War II. However, the Brickworks also experienced substantial growth during the 1920s and 1950s, with additional kilns added during both periods and a narrow-gauge railway constructed in 1923. The railway was subsequently decommissioned in 1927, however, it remains evident on-site. These various elements contribute to the historic significance of the site, in that the Brickworks represents a cultural landscape and evolution of industrial processes over a 60-year period.

The Canberra Brickworks also played a significant role in the development of Canberra, particularly for the initial period between 1923 and 1927. Bricks, including those colloquially referred to as 'Canberra Reds', were loaded onto timber tip wagons and transported via the narrow-gauge railway to the major developments across the city at the time. This included Old Parliament House, the Kingston Powerhouse, Hotel Canberra, buildings in Civic, as well as Federal Capital Commission houses for the growing population.

By 1973 the Brickworks required modernisation and expansion that was not sustainable for the site. The National Capital Development Commission (NCDC) rejected any proposal to upgrade the Brickworks on the basis that:

- The land was needed for residential purposes
- Neighbourhood roads were being used excessively by heavy traffic, and
- The levels of air pollution generated by the Brickworks were incompatible with the amenity of residential uses nearby.

The Brickworks at Yarralumla was closed in 1976 and relocated to Mitchell. This decision to relocate the Brickworks sought to re-establish the vision of the original Walter Burley Griffin City and Environs plan, which designated the area as a development node. However, by 1982 the Brickworks site at Yarralumla was recognised for its heritage value, having been placed on the Register of the National Estate (since repealed).

The Conservation Plan for the Old Canberra Brickworks was then prepared and included a policy which:

> *…seeks active and complementary uses for the site to ensure its conservation and interpretation in a way that is appropriate to the cultural significance of the site and its elements.* [1]

The purpose of this plan was to ensure that the heritage fabric, built elements and values of the Old Canberra Brickworks were retained on the site where appropriate.

[1] Sourced from *Yarralumla Brickworks South Canberra Policy Plan* (NCDC, 1988)

The Yarralumla Brickworks South Canberra Policy Plan (NCDC, 1988) was then published as a land use policy for the future use of the site. This included separating the site into five distinct areas containing open space, medium density residential, retail, offices, commercial accommodation, arts and crafts, and other recreational uses. Since the preparation of this plan, there have been several attempts by the ACT Government and the private sector to redevelop the Canberra Brickworks. These proposals have mostly included similar land uses, namely retail, office space and medium-density housing.

In 2010 the Land Development Agency (LDA) became involved in the redevelopment of the Canberra Brickworks through the preparation of planning and development strategies for the site. In 2010 and 2011, initial planning work and background studies were undertaken, along with the preparation of an updated Conservation Management Plan (CMP) and a Site Analysis Report. Community consultation also commenced in April 2010, which informed the Draft Planning Strategy for the site. The Canberra Brickworks and Environs Planning and Development Strategy (Hill Thalis Architecture, 2013) was subsequently prepared and further consultation on the 2013 Strategy was carried out, including a review and analysis of all comments and submissions received. The Strategy was subsequently revised, with the preparation and release of the Revised Canberra Brickworks and Environs Planning and Development Strategy (LDA, 2015).

In 2016, a request for tenders for the redevelopment of the CBP was issued by the LDA. The Proponent was ultimately selected as the preferred tenderer in April 2017. A Scoping Document Application was submitted to EPSDD on 28 November 2019, with the Scoping Document issued on 16 January 2020. A Draft Environmental Impact Statement (EIS) was then submitted on 3 June 2021, with the draft EIS placed on public exhibition from 8 June to 21 July 2021. A request for a revised EIS was then issued by the EPSDD on 4 August 2021.

This revised EIS submission is consistent with the EPSDD's guidelines for the preparation of EIS and addresses the issues raised within the Scoping Document. This revised EIS also responds to agency and community submissions received during public exhibition.

The proposed Masterplan in this revised EIS has been refined in response to community and agency consultation. The figures in the EIS reflect this proposed Masterplan; however, due to the ongoing nature of design development, drawings and plans provided in the appendices may indicate a slightly different building footprint. The revised EIS has assessed the maximum impacts across the site, and it is expected that any design developments between the EIS and the EDP and any subsequent development application is unlikely to result in any additional or unforeseen impacts. Further, any design developments will be subject to further assessment through subsequent development applications.

1.3 Objectives

The vision for the redevelopment of the CBP, as outlined within the Planning and Development Strategy (LDA, 2015) and the Doma Request for Tender (RFT) response (Doma, 2017), is to achieve the following development outcomes:

- The celebration of heritage by establishing a viable future use for the Brickworks to ensure its physical conservation and to protect its history.
- Integration with the landscape by embedding the existing 'garden suburb' landscape character into the design of the streets, parklands, public and private space.

- Providing streets for people by making safe movement of pedestrians and cyclists a priority.
- Provision of diversity of housing through innovative housing types to suit the diversity and needs of a growing Canberra.
- Ensure environmental sustainability by creating unique environmentally sustainable development, homes, streets and open spaces.

1.3.1 Garden City Principles

The proposed redevelopment has been designed according to 'Garden City' principles. The concept of the Garden City was developed by Ebenezer Howard in 1902,[2] and has since been distilled into a number of key principles. These principles are the elements of the Garden City model of development that have seen it so successful.

The Garden City is a holistically planned new settlement (e.g. the Burley Griffin Plan of Canberra), which enhances the natural environment and offers high-quality affordable housing and locally accessible work in beautiful, healthy and sociable communities. The Garden City Principles are an indivisible and interlocking framework for delivery, and include (UK Town and Country Planning Association, 2020):

- Land value capture for the benefit of the community.
- Strong vision, leadership and community engagement.
- Community ownership of land and long-term stewardship of assets.
- Mixed-tenure homes and housing types that are genuinely affordable.
- A wide range of local jobs in the Garden City within easy commuting distance of homes.
- Beautifully and imaginatively designed homes with gardens, combining the best of town and country to create healthy communities, and including opportunities to grow food.
- Development that enhances the natural environment, providing a comprehensive green infrastructure network and net biodiversity gains, and that uses zero-carbon and energy-positive technology to ensure climate resilience.
- Strong cultural, recreational and shopping facilities in walkable, vibrant, social neighbourhoods.
- Integrated and accessible transport systems, with walking, cycling and public transport designed to be the most attractive forms of local transport.

Canberra is a well-recognised and successful example of the Garden City. A primary aim of the Proposal is to uphold these principles and integrate the proposed redevelopment into the Garden City character of Canberra. This is further discussed throughout this EIS.

[2] E. Howard (1902) *Garden Cities of To-Morrow* (London, 1902. Reprinted, edited with a Preface by F. J. Osborn and an Introductory Essay by Lewis Mumford. (London: Faber and Faber, [1946]).

1.4 Justification

All development carried out in Canberra is undertaken in a manner consistent with the strategic directions of the ACT Government, ACT Legislative Assembly, Commonwealth Government and community through various legislation, policies, and plans. As such, the reuse and adaptation of the CBP has evolved over 12 years through a series of planning and development strategies investigated and prepared by the Suburban Land Agency (SLA) (formerly the ACT LDA).

Under the finalised Canberra Brickworks and Environs Planning and Development Strategy (LDA, 2015), the development of the CBP was considered to be consistent with the nine strategies outlined within the ACT Planning Strategy 2012 (ACT Environment and Sustainable Development Directorate (ESDD), 2012a), and has subsequently been reassessed against the five themes and accompanying strategic directions under the more recent ACT Planning Strategy 2018 (EPSDD, 2018). The proposed reuse and adaptation of the CBP remains consistent with the planning objectives of the ACT, as this locality was chosen having regard for the Walter Burley Griffin City and Environs plan, which identified the area as a significant development node for the city. The reuse and adaptation of the CBP would realise the Burley Griffin vision for the development node within this locality.

The following benefits associated with the redevelopment of the CBP are also outlined within the Planning and Development Strategy (LDA, 2015):

- The CBP is within close proximity to the Adelaide Avenue and Cotter Road rapid transport routes, ensuring improved mobility and convenient travel.
- The redevelopment of the CBP provides the opportunity to develop alternative housing options in Yarralumla that are currently in limited supply, e.g. townhouses, terraces and apartments.
- There is opportunity to integrate the Canberra Brickworks with high-quality urban parkland accessible to the Canberra community.
- Urban infill within the CBP would make more efficient use of existing infrastructure and promote a more compact and sustainable city, as well as improving transport, pedestrian and cycle linkages.

These factors, along with its strategic historical context, provide strong justification for the redevelopment of the CBP. The reuse and adaptation of the CBP would be consistent with existing policy objectives, as well as fulfilling the Burley Griffin vision for Canberra. Further detail regarding the strategic context for the redevelopment of the CBP can be found in **Section 3.0**.

1.5 Proponent

Doma is a leading investment and development company within the ACT, having been a significant participant in the property industry, in all sectors including multi-unit residential apartments, commercial space, hotels, retail and carparks. Notable residential developments that Doma has delivered in the ACT include ‘Dockside’ and ‘The Pier’ in the Kingston Foreshore, and ‘Realm Park’ in Barton.

Doma was selected by the LDA (now SLA) as the preferred tenderer in 2017 for the reuse and adaptation of the CBP.

Table 1.1 Proponent's Details

Details	Proponent
Organisation Name	Doma Group
Postal Address	4/3 Sydney Avenue Barton ACT 2600 PO Box 5419 Kingston ACT 2604 Australia
ABN	31 616 498 670 – Canberra Brickworks Developments Pty Ltd
Contact Person	Alex Moulis – Senior Development Manager
Phone	M: 0425 166 643
Email	alex@domagroup.com.au

1.6 Scoping Document

An application under Section 212(1) of the PD Act for Scoping of an EIS was lodged to the EPSDD on 28 November 2019. A Scoping Document was subsequently issued under Division 8.2.2 of the PD Act, on 16 January 2020. A copy of the Scoping Document is included in **Appendix A**. A cross-reference table for the Scoping Document to the relevant section of the EIS is provided in **Appendix B**.

2.0 Proposal Details

Section Summary
This Section provides a detailed description of the Proposal and the Proposal Area. The associated project, the upgrade and construction of a site access road at Dudley Street, is also described. A summary of the alternative development options considered for the Proposal is also provided within this Section.

2.1 Property Description Overview

Formal identification of the Proposal Area and proposed changes to its zoning and land tenure are summarised in **Table 2.1** below.

Table 2.1 Key Property Information

Site Address	End of Denman Street, Yarralumla, ACT
Allotment Description	Block 7 Section 102, Yarralumla Block 1 Section 102, Yarralumla. Canberra Central: Registered Rural Block No: 764 Block 20 Section 102, Yarralumla
Land Zoning	CZ6: Leisure and Accommodation RZ1: Suburban
Leaseholder	ACT Government, managed by the SLA There is no current lease on any of the subject blocks
Current Land Use	Vacant – former brickworks
Proposed Land Use	Mixed use including residential, commercial and public space Development Precincts are defined as follows: • Heritage Core – Commercial Land use. • Road and Open Space Network. • Precincts 1, 2, 3, 4, 5, 6, 7, 8, 9 – Medium Density Residential. • Individual Housing Block Precinct – Low Density Residential.
Total Area	Approximately 16 ha
Permitted uses	The following uses are proposed (main uses) for the CZ6 zone which are permitted under the CZ6 development table as future merit track assessable development: • craft workshop • restaurant • shop • drink establishment • indoor entertainment facility • indoor recreation facility.

Site Address	End of Denman Street, Yarralumla, ACT
	Office and residential uses are also proposed for the CZ6 zoned sites. These uses are allowed as additional merit track development. No permitted land use variations are required for the existing lease. Note: Land use purposes permitted by any relevant lease is not applicable.
Proposed Land Tenure	A Draft Land Tenure Plan would be provided as part of an Estate Development Plan (EDP) development application. Various land tenure schemes would be included in the EDP, including separate title individual Crown Leases; unit titled buildings contained within a Community Title scheme; three-dimensional subdivision (car park owned under commercial Crown Lease, residential Units Plan above), where both commercial and residential blocks are contained within a Community Title scheme; and the remaining land would be held under a Community Title Scheme.

2.2 Location Description

The Proposal Area, also referred to as the CBP, is located in south-west Yarralumla, to the west of central Canberra in the ACT (refer to **Figure 1.1**). The Proposal Area is situated on Territory Land located on Blocks 1, 7, and 20, Section 102, in the Division of Yarralumla, with an area of 16.09 ha.

Access to the CBP is presently from Denman Street only. The Proposal Area is bounded by Bentham Street to the north; low density residential development to the north, north-east and east; open space to the south; and the Royal Canberra Golf Club to the west (refer to **Figure 1.2**). The golf club forms part of the heritage listed Westbourne Woods, which also include an arboretum and nursery that were established in 1914. It is noted that the Westbourne Woods do not extend into the Proposal Area.

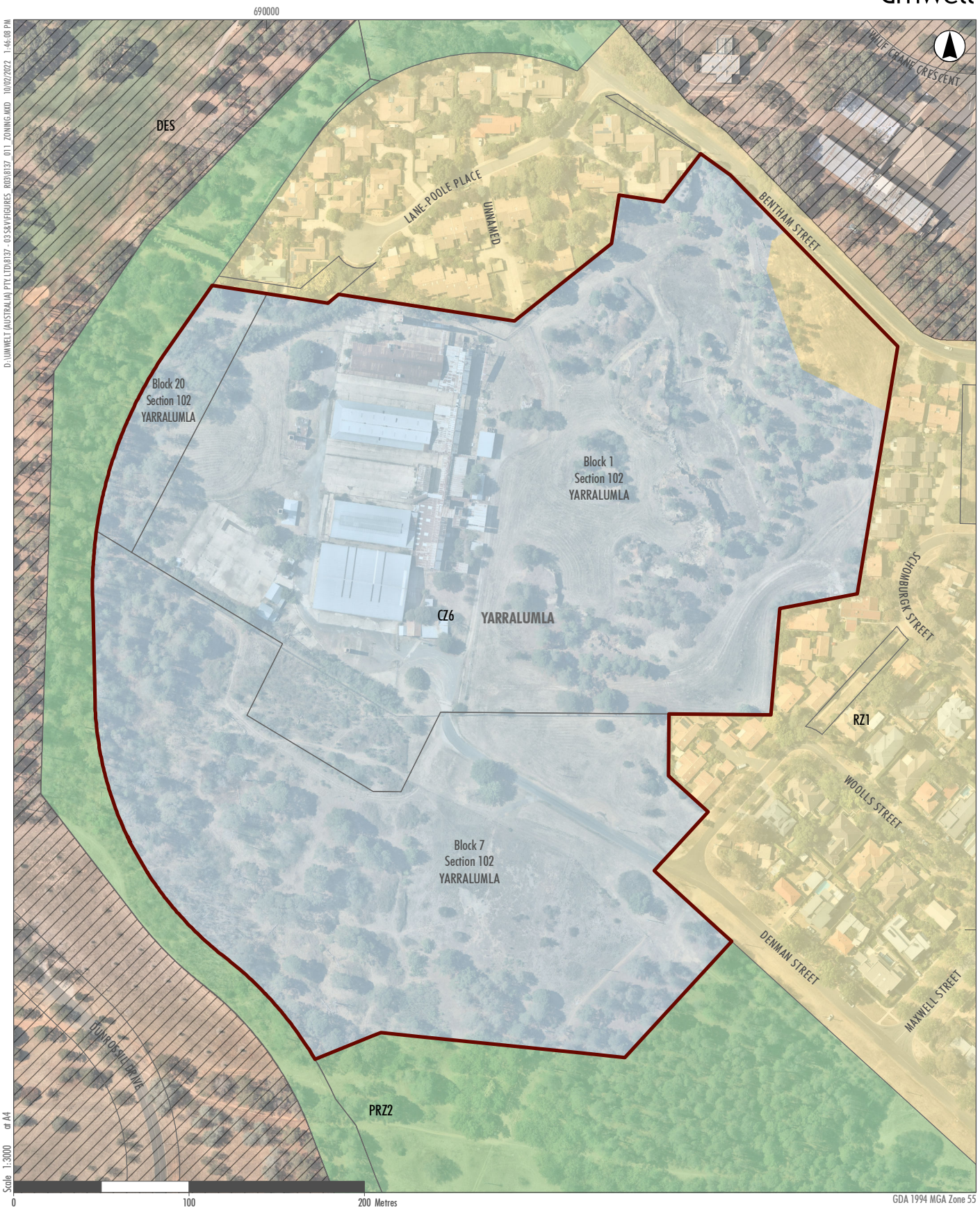
The CBP is approximately 7 km from the Canberra CBD and 2 km south of Lake Burley Griffin. Government House, the official residence of the Governor-General of Australia, lies approximately 1 km to the north-west of the CBP.

2.3 Land Use

The Canberra Brickworks was operational in the Proposal Area from 1913 to 1976. The Proposal Area has been largely vacant since that time and contains the former Canberra Brickworks buildings and infrastructure, associated quarry and railway remnants. Open grassland occurs to the south, with self-seeded landscape trees (predominantly exotic pine species) located throughout the quarry area and along the Proposal Area boundaries.

As demonstrated in **Figure 2.1**, the Proposal Area is zoned CZ6 Leisure and Accommodation, with a small portion in the north-eastern corner zoned RZ1 Suburban. Under the Yarralumla Precinct Map and Code (ESDD, 2012b), additional uses are permitted within the CZ6 zone within the CBP, including 'business agency', 'office' and 'residential use'. All uses proposed for the redevelopment of the CBP are permissible under the Territory Plan. These uses are subject to design limitations, including gross floor area and height, as further discussed in **Section 3.3** and **Section 5.0**.

The CBP has a history of land disturbance, predominantly associated with its 60-year history operating as a brickworks that sourced materials from a quarry on-site. As a result, fill material is present throughout the site, primarily consisting of brick waste, ash, quarry cuttings (shale) and traces of anthropogenic inclusions (glass, metal and bitumen) (SMEC, 2013) (refer to Appendix F22 in **Appendix F**). While an area containing asbestos has been identified, no widespread contamination is apparent within the Proposal Area, as discussed in **Section 18.0**.



Legend

- Proposal Area

Land-use Zoning

Residential

- RZ1 - Suburban

Designated Areas

- Designated

Parks & Recreation

- PRZ2 - Restricted Access Recreation Zone

Commercial

- CZ6 - Leisure & Accomodation

FIGURE 2.1

Territory Plan Land Use Zoning

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory

There are no permanent watercourses within the Proposal Area; however, surface flows generally discharge into Lake Burley Griffin/Molonglo River and subsequently into the Murrumbidgee River. The former quarry is considered to be an ephemeral water body, with the pit area occasionally filling with rainwater. Samples have indicated that this water is acidic, most likely the result of decaying organic matter (plant material) (SMEC, 2016b) (refer to Appendix F15 in **Appendix F**).

Informal car parking is present at the existing entrance of the Brickworks, off Denman Street, which was used by a local recycled timber business that operated from the site prior to 2017. This business has since relocated, and the Proposal Area remains vacant.

The Proposal Area has scattered exotic, degraded vegetation (predominantly *Pinus radiata*) and contains informal walking trails used by Yarralumla residents (refer to **Figure 2.1** to **Figure 2.4**). Public access to the Canberra Brickworks heritage precinct (that is, the existing buildings and quarry) is currently restricted by fences. However, the remainder of the Proposal Area is open to public access. There is evidence of trespass through the CBP buildings, with anti-social activities clearly apparent throughout the site, including graffiti and drug paraphernalia.

Photo 2.1 Hardy Patent Kiln 2 with signs of vandalism (Umwelt, 2020)

Photo 2.2 Staffordshire Kiln from Original Brickyard with overgrown vegetation (Umwelt, 2020)

Photo 2.3 Fan House for Hardy Patent Kiln 1 in dilapidated state (Umwelt, 2020)

Photo 2.4 Primary Crusher Room with overgrown vegetation and scattered remnants (Umwelt, 2020)

2.4 Surrounding Land Use and Development

The CBP is situated towards the south-western boundary of the suburb of Yarralumla. As previously described, the following land uses immediately border the Proposal Area:

- Medium and low density residential to the north.
- Medium and low density residential to the east.
- Open space to the south.
- The Royal Canberra Golf Club, which forms part of the Westbourne Woods, to the west.

The suburb of Yarralumla is located in the South Canberra district and is bordered by Lake Burley Griffin to the north, Commonwealth Avenue and Capital Hill to the east, Adelaide Avenue and the Cotter Road to the south, and Scrivener Dam, Lady Denman Drive and part of the Molonglo River to the west. The suburb covers an area of approximately 8.8 square kilometres, and according to the 2016 census[3] comprises a population of 2,890. More than half of this area consists of open space or non-residential development, including Weston and Stirling Parks, the Royal Canberra Golf Club, and the grounds of Government House. A number of houses within the suburb are also occupied by diplomatic missions.

[3] http://www.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC80131?opendocument

The Yarralumla local shopping centre is situated approximately 1 km east of the Proposal Area, being at the corner of Bentham and Novar Streets. Meanwhile, Weston Park is situated approximately 2 km north of the Proposal Area, located on a peninsula at the western end of Lake Burley Griffin.

To the north and west of the CBP are the Westbourne Woods that are a remnant landscape preserved within the grounds of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Royal Canberra Golf Club and the Yarralumla Nursery on the lake shore. The Westbourne Woods are listed as occurring in Block 2 Section 119, Block 1 Section 125, Block 4 Section 118, Yarralumla, Canberra Central, and do not form part of the CBP.

Additionally, to the north-west of the Proposal Area is the Commonwealth heritage listed former Australian Forestry School on Banks Street. The School was officially opened in 1927, is designed in the Inter-War Stripped Classical Style, and is recognised for its strong associations with the early development of the Federal Capital.

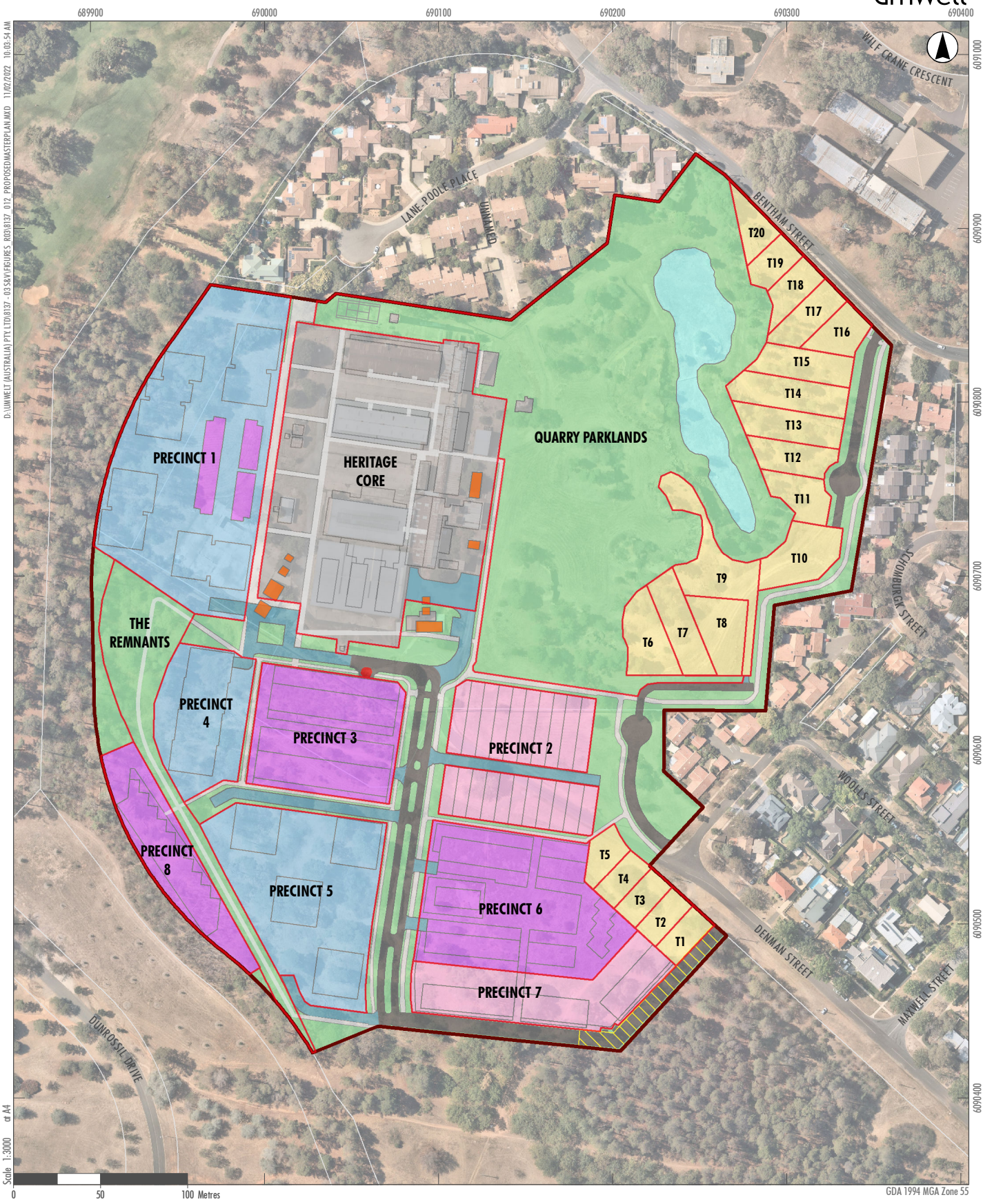
2.5 Description of the Proposal

The Proposal comprises the redevelopment of the former Canberra Brickworks in a mixed use residential, commercial, and retail development that utilises many of the original heritage elements.

The Proposal would provide a maximum of 380 residential dwellings and recreational parkland around the re-purposed Canberra Brickworks buildings and former quarry (refer to **Figure 2.2**). It is noted that the masterplan has not been finalised. However, this EIS has considered the maximum potential level of urban density within each area of the Proposal Area and has assumed that the entire site will be directly impacted by the proposed redevelopment.

While the Proposal Area is currently only accessible off Denman Street, the Proposal has been designed so that the primary access would be from the south via Dudley Street, through the approved new access road, referred to as 'Brickworks Way' within this EIS. This road and its potential impacts have been subject to a separate approval process, with construction of the new road nearing completion at the time of this EIS being prepared.

Minor access roads would be available from Bentham Street and Denman Street to service a small percentage of the dwellings. These roads would not interlink with Brickworks Way and vehicles (apart from emergency services vehicles) would not be able to pass through the site to shortcut access to Bentham or Denman Streets from Dudley Street. Adequate car parking would be provided within the CBP for residents with separate public car parking for offices, retail, and recreational users (refer to **Section 7.0**). This would be developed in accordance with the ACT Parking and Vehicular Access General Code (ACT Planning and Land Authority, 2014).



Legend

- Proposal Area
- Apartment Typology
- Heritage Precinct
- Single Dwelling Block with Community Title Scheme
- Single Dwelling Lots
- Terrace Typology
- Open Space
- Water
- Inner Asset Protection Zone
- Structures to be Demolished

FIGURE 2.2

Proposed Masterplan

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2021)

Given the heritage value of the CBP, the proposed development would maintain a focus on providing urban parkland that conforms to the existing landscape and surrounding urban areas. The Proposal would consist of the following components:

- Low-density dwelling houses, positioned to the east of the existing quarry pit, with access via a public cul-de-sac off Bentham Street; and further dwelling houses positioned at the south-east corner of the precinct, abutting Denman Street. These buildings would be designed with reference to the Yarralumla Precinct Map and Code (YPMC) (ESDD, 2012b) requirements.

- A mixture of apartment buildings and terraces, designed with reference to the YPMC, positioned around the proposed entrance off Dudley Street, identified as Brickworks Way on the current masterplan.

- The YPMC requires that no residential building exceeds three storeys in height. Some of the residential buildings will contain an attic within the roof form, although this is not considered a storey in the Territory Plan.

- The heritage listed Yarralumla Brickworks Railway Remnants will be retained within open space/parkland in an area referred to as the 'Rail Play' area. This will include landscape elements that will facilitate and encourage physical activity for both children and adults.

- The Brickyard Heritage Precinct includes the adaptive reuse of heritage buildings to allow for retail and commercial spaces including an artisanal food, drink and produce hub; health and wellness facilities; bike mechanic; interpretive features; and auxiliary facilities for residents and visitors, including a gymnasium, swimming pool, tennis courts and gardens.

While the mix of houses, terraces and/or apartments may vary following finalisation of the masterplan, the Proposal would provide an absolute total **maximum of 380 dwellings** within the Proposal Area.
An approximate population yield of 960 to 1,300 people is anticipated for the Proposal.

In recognition of the heritage values of the Canberra Brickworks and former quarry, the Proposal would see the majority of 'core' and 'supporting' individual heritage elements and the essential industrial characteristics of the Canberra Brickworks heritage site retained, conserved, and sensitively reused. This is further discussed in **Section 17.0**.

The former quarry area would be used as urban parkland that would be sensitive to the geological heritage values of the site while allowing a recreational space that is linked to existing and proposed walking and cycle paths.

The Tree Assessment Report and Tree Management Report prepared by dsb Landscape Architects (2015) (refer to Appendix F10 in **Appendix F**) has identified that the vast majority of the trees in the Proposal Area should be removed due to deterioration in their condition and the associated safety risks. The Proposal includes the early incorporation of landscaping features to provide privacy for existing neighbours; define entrances, streetscapes, and pathways; to screen infrastructure elements; to create a cooler and more liveable precinct and provide parkland and open space (refer to **Section 9.0**).

An inner asset protection zone within the western boundary of the Proposal Area is not required as vegetation within the Royal Canberra Golf Club, Dunrossil Drive and Cotter Road area and in Block 1, Section 127 Yarralumla is managed to minimise bushfire risk. An inner asset protection zone has been provided along the southern boundary of the Proposal Area (refer to **Section 14.0**).

2.6 Associated Projects

The Proposal is linked to a secondary project to upgrade Dudley Street and to construct an access road into the CBP (**Figure 2.6**). The access road would service the majority of the proposed residential areas and the proposed redeveloped Brickworks buildings.

Dudley Street has recently been upgraded to a 10 m-wide single carriageway to meet current demand and improve public safety. To reduce inconvenience and impacts to the public, a 180 m access road (minor collector road) is also being constructed from Dudley Street into the CBP.

The upgrade of Dudley Street and the access road to the CBP, referred to as Brickworks Way throughout this EIS, was assessed in a separate application undertaken by the ACT Government's Infrastructure Finance and Capital Works (IFCW).

The details of the access road and Dudley Street upgrade were included in a separate Referral to the former Commonwealth Department of Environment and Energy (DoEE) prepared under the EPBC Act (2017/8072) and a separate Review of Environmental Factors (AECOM, 2018) prepared to support an EIS Exemption in accordance with s. 211 of the PD Act, National Capital Authority (NCA) Works Approval, and EPBC Act Referral.

The EPBC Act Referral for the Dudley Street upgrade was approved with conditions on 27 February 2019 and an EIS exemption was granted by the ACT Minister for Planning and Land Management on 4 April 2019.

2.7 Construction Matters

2.7.1 Staging

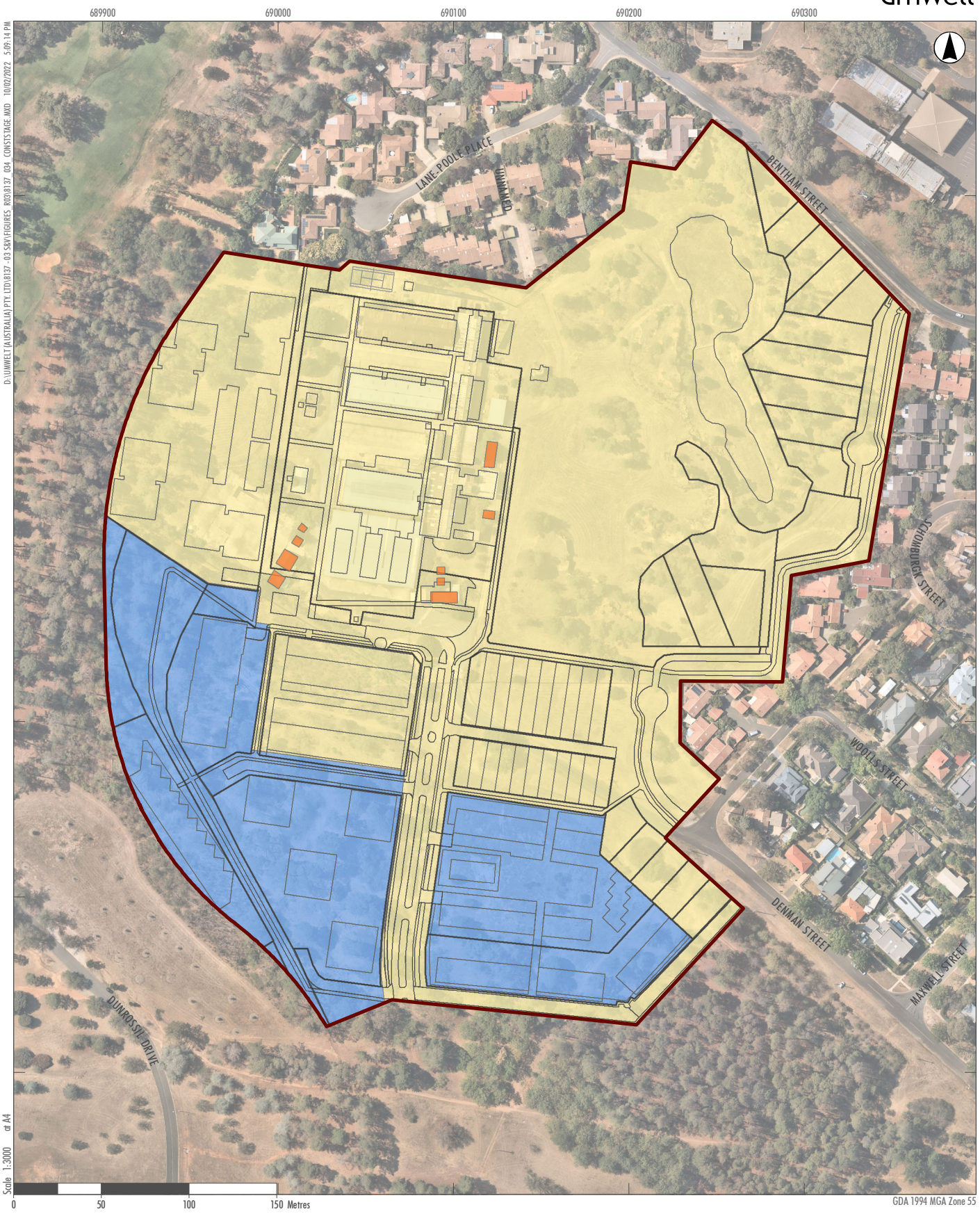
It is proposed that development of the CBP would occur in stages. The initial stage is focused on tree removal, landscaping, remediation, infrastructure, adaptation and repurposing of heritage buildings and the first stage of residential development. Remediation includes demolition, site clean-up, the storage of reusable material and removal/treatment of hazardous materials in accordance with the Site Management Plan (SMP) and Remediation Works Plan (RWP) (refer to **Section 18.3**). The Quarry Parklands would also be completed in the first stage. Site preparation and civil works would include construction traffic management (access from Dudley Street and construction workers carpark); establishment of bushfire management zones; heritage protection works; service infrastructure upgrades; vegetation management and landscaping; and the conservation and adaptive use works of key heritage elements including establishment of parks and heritage interpretation.

The second stage would include progressive development of residential precincts in response to market demand and finalising landscaping (refer to **Figure 2.3**). It would also deliver the landscape solution to the Railway Remnants and Dunrossil Estate.

Construction staging and timing will be further detailed during the development application stage of assessment. **Table 2.2** provides indicative timeframes that will be refined as the Proposal progresses.

Table 2.2 Indicative Timing

Proposed Stage	Indicative Commencement Date	Indicative Completion Date
Approvals	June 2021	July 2023
Finalisation of Design	June 2021	July 2023
Construction		
Stage 1	July 2023	February 2025
Stage 2A	August 2023	July 2025
Stage 2B	January 2025	May 2026
Stage 2C	November 2025	November 2026



Legend

- Proposal Area
- Structures to be Demolished
- Stage 1
- Stage 2

FIGURE 2.3

Construction Staging Plan

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory

2.7.2 Offsite Works

Offsite works are proposed along the Proposal Area's street frontages on Denman Street and Bentham Street. These areas are known as Block 1, Section 127 and Block 3, Section 94 in the division of Yarralumla. The purpose of these offsite works would be for:

- Connection to the existing road network (refer to Section 7.0).
- Connection to existing off site utility services (refer to **Section 6.0**).
- Connection to existing active travel networks.

Offsite utility connections will primarily occur on Denman Street and Bentham Street. This is depicted in the relevant utility plans in Appendices F1 – F4 in **Appendix F**. Detailed offsite work plans will be provided during the Development Application (DA) phase of the Proposal. Connection to existing sewerage and water mains would be carried out by Icon Water. These offsite works would be managed through a Construction Environmental Management Plan (CEMP), the timing of which would be identified in consultation with the ACT Government.

2.7.3 Plant and Equipment

The following plant and equipment are likely to be used at the Proposal Area during construction:

- Trucks
- Cranes
- Excavators
- Elevated platform vehicles
- Concrete trucks
- Dozers
- Scrapers
- Graders
- Water carts
- Compactors
- Vibratory rollers, and
- Hand-held equipment.

Figure 2.4 below demonstrates the anticipated scale of the equipment likely to be used during construction. The precise numbers of machinery and equipment to be used have not yet been finalised. This will be provided during the DA stages of the assessment process, which would also assist in informing detailed construction noise assessments (refer to **Section 13.0**).

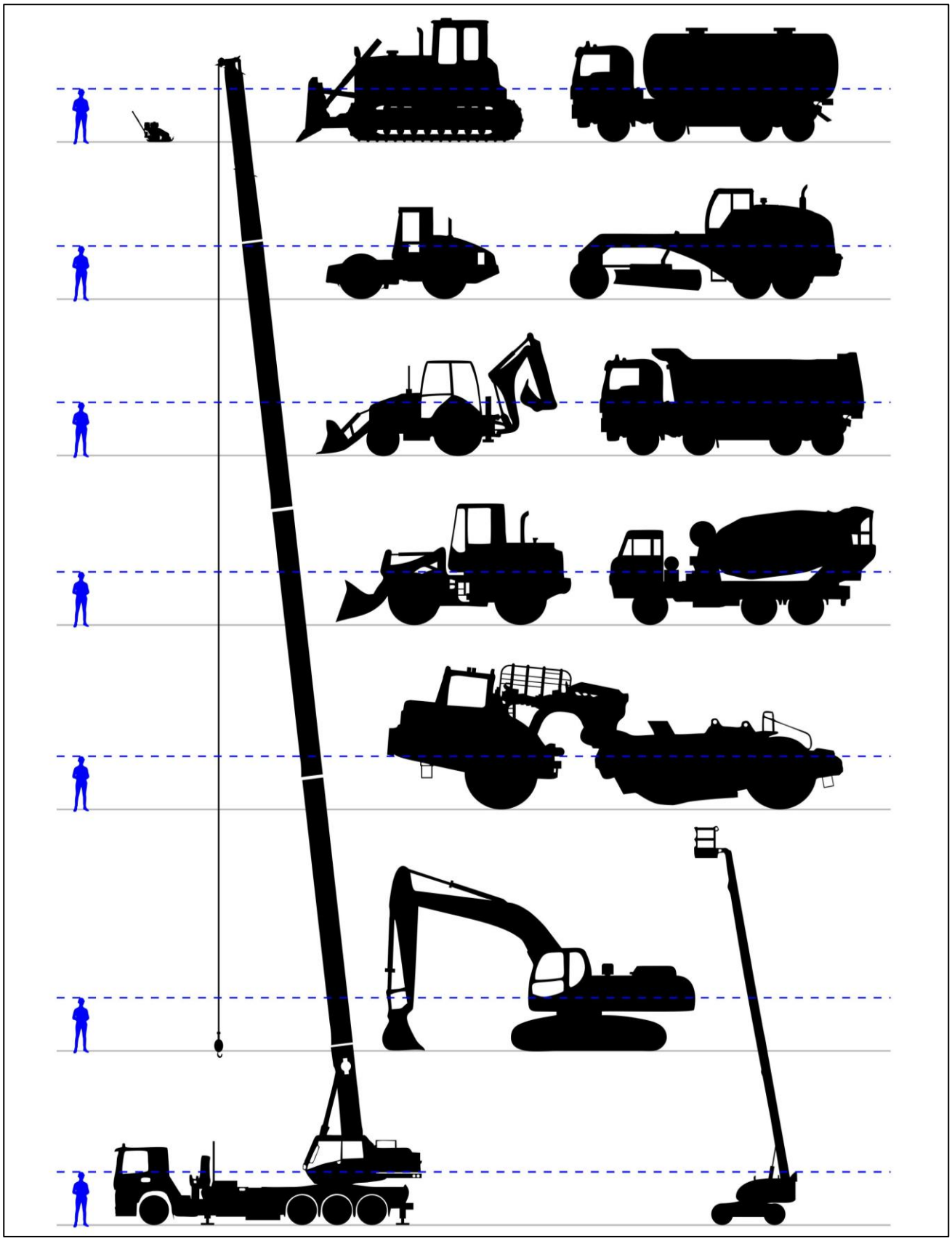


Figure 2.4 Scale of Construction Equipment

2.7.4 Remediation and Earthworks

The existing topographical features of the Proposal Area are generally proposed to be retained. However, it is proposed that the north-eastern quarry spur is infilled in order to meet Crime Prevention Through Environmental Design (CPTED) principles. The impacts of the Proposal on the geological heritage of the area are discussed in **Section 17.0** of this EIS.

Remediation works are also proposed across the Proposal Area. These works would be subject to a separate DA assessment. At this stage, contaminants that cannot be adequately treated (e.g., asbestos) are proposed to be contained within a sealed container, buried, and capped on site. This remediation work would be undertaken in accordance with an approved RWP and SMP. This is further discussed in **Section 18.0** of this EIS.

2.8 Alternatives Considered

2.8.1 Selection of the Preferred Option

As discussed in **Section 1.2**, the LDA (now SLA) became involved in the redevelopment of the Canberra Brickworks in 2010 through the preparation of Planning and Development Strategies for the site which culminated in the preparation and release of the Revised Canberra Brickworks and Environs Planning and Development Strategy (LDA, 2015).

A two-stage sale process was undertaken during 2016 and 2017 to achieve the best possible design outcome for the CBP. The first stage involved a Request for Proposal (RFP) in April 2016, in which five submissions were received. These submissions were evaluated by the SLA against the Revised Canberra Brickworks and Environs Planning and Development Strategy (LDA, 2015). The evaluation of all concept design submissions resulted in two successful tenderers being shortlisted, with the Proponent being announced as the preferred tenderer on 11 April 2017.

A Community Panel approach was taken for the Canberra Brickworks redevelopment tender process. The Community Panel included appointed representatives of key community groups, including the Yarralumla Residents Association, the Inner South Canberra Community Council, the National Trust, See Change Inner-South, the Geological Society of Canberra, and Pedal Power ACT.

The Community Panel was established during the pre-tender process, which led to the formulation of the Community Objectives to guide the ACT Government's tender evaluation process (refer to **Section 19.0**). The Community Objectives set out community expectations for the new development. It is important to note that while the Community Objectives have been used to guide both the tender process and subsequent design development, not all of these objectives were included in the final Concept Delivery Deed (CDD). These objectives are also not characterised as statutory planning or environmental requirements and are therefore not relevant to the assessment included in this EIS.

The aim of the Community Panel was to identify and incorporate any issues raised by community members and stakeholders into the proposed redevelopment at the early concept stage and throughout subsequent design stages. The Community Panel also assisted in reviewing how the short-listed proposals responded to the Community Objectives. The Community Panel met with the two short-listed proponents during the tender process. The selection of the Proponent as the preferred tenderer was made by the ACT Government and the SLA, with reference to the Community Panel recommendations.

The alternative designs by the other four tenderers are considered commercial-in-confidence. Nonetheless, the tender process described above demonstrates that the CBP redevelopment proposal has undergone extensive design scrutiny.

2.8.2 No Development and Consequences of Not Proceeding

As outlined in **Section 1.4**, there is a strong policy justification for the redevelopment of the CBP. The redevelopment represents a provision of brownfield land supply that is necessary for meeting housing demands in the coming years within the ACT. Adaptive reuse of sites such as the CBP will also serve to minimise reliance on greenfield developments, resulting in fewer associated impacts on the environment and improved overall sustainability. Furthermore, the reuse and adaptation of the CBP represents the realisation of the Burley Griffin vision for the Yarralumla area. The development also creates new employment, creative and social opportunities, with the provision of commercial, retail and open space.

The option of no development is considered to be an undesirable option, not only from a policy perspective for the ACT, but also for the condition of the site. The heritage significance of the CBP is likely to deteriorate without ongoing maintenance while decaying structures and trees are likely to pose a safety risk to the public. The existing isolated layout of the CBP may also encourage anti-social behaviour.

The option of no development is consequently considered to be an unsustainable and undesirable option for the site and the ACT community as a whole.

2.8.3 Design Amendments

Design amendments have occurred since the Proponent was announced as preferred tenderer for the Proposal in 2017. These amendments have resulted in a significant reduction in housing density within the proposed design, with apartment numbers being reduced to make allowance for townhouses and houses. These amendments are apparent in the previous iterations of the proposed masterplan as shown in **Figure 2.5** and **Figure 2.6**. **Figure 2.2** (in **Section 2.5**) presents the most recent version the proposed masterplan that has been subject to the assessment included in this EIS.

Of note, community and agency engagement has resulted in the following changes to the masterplan:

- A substantial increase to the number of car parks to be delivered as part of the Proposal.
- Changes to the masterplan to break up originally proposed apartment buildings into smaller blocks, re-siting them and adding further landscaping.
- Changes to the south-eastern corner of the Proposal Area through provision of a boundary road to meet ACT bushfire asset protection zone requirements.

These design changes have sought to alleviate community and agency concern over certain aspects of the Proposal, particularly relating to traffic and bushfire management. This version of the masterplan has been prepared in response to community and government entity feedback received during public exhibition of the draft EIS.

It is noted that, due to the extent of disturbance within the Proposal Area, avoidance of areas of golden sun moth habitat and contamination impacts could not be achieved. Celebrating the heritage values of the Proposal Area has been a key objective of the Proposal, with finalisation of the design of the Heritage Core to be determined during the DA stage. Where safe to do so, trees have also been retained. However, due to many being in poor condition, it is expected that the majority of trees within the Proposal Area will require replacement. This is further discussed in **Section 9.0**.

The final design of the Proposal remains uncertain at this stage, particularly regarding specific impacts that may result in damage to the heritage fabric of the Proposal Area. However, the Proponent has sought to ensure that the heritage of the Proposal Area is celebrated and remains the central focus of the Proposal Area.

Design changes made to assist in this include reducing the scale and bulk of development surrounding the Heritage Core. This is apparent in **Figure 2.2**, with terraces and single dwelling blocks now surrounding the Heritage Core, as opposed to apartment buildings, as demonstrated in **Figure 2.5**. Reduced density is also proposed around the quarry compared to the original masterplan, with single dwelling properties now proposed rather than terraces. This was to ensure that minimal filling of the quarry would be required, and that the natural heritage significance of the area would be preserved.

The potential heritage impacts of the Proposal are discussed further in **Section 17.0**.

Figure 2.5 Original Masterplan

Figure 2.6 Revised Masterplan 2020 (not current)

Note: for current masterplan, see **Figure 2.2**.

3.0 Legislative and Strategic Context

Section Summary
This Section provides an outline of the various Territory and Commonwealth legislation and planning policies applicable to the Proposal. The Proposal is being assessed concurrently under the ACT *Planning and Development Act 2007* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, through the bilateral process.

3.1 Statutory Requirements

This EIS has been prepared with consideration for the following relevant legislation:

ACT Legislation

- Australian Capital Territory (Planning and Land Management) Act 1988 (PALM Act)
- Planning and Development Act 2007 (PD Act)
- Planning and Development Regulations 2008
- Environment Protection Act 1997 (EP Act)
- Emergencies Act 2004
- Heritage Act 2004
- Nature Conservation Act 1980 (NC Act)
- Tree Protection Act 2005, and
- Climate Change and Greenhouse Gas Reduction Act 2010 and its Interim Targets Determination 2018.

Commonwealth Legislation

- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- Aboriginal and Torres Strait Islander Heritage Protection Act 1984, and
- Native Title Act 1993.

Each of these instruments are considered separately in the following sections.

3.1.1 Australian Capital Territory (Planning and Land Management) Act 1988

The introduction of self-government for the ACT in 1988 created a circumstance where two governments, the Australian Government, and the ACT Government, share responsibility for the further development of the Territory.

The PALM Act provides that land used by or on behalf of the Commonwealth may be declared National Land, managed by the Commonwealth. The remaining lands of the Territory are Territory Land, managed by the ACT Government on behalf of the Commonwealth.

In order to maintain a broad oversight of planning in the Territory as a whole, and to ensure its involvement in the planning, design and development of those areas having the special characteristics of the National Capital, the Commonwealth established the National Capital Authority to reflect its interests and carry out its intentions (refer to **Section 3.3.1**).

Through the PALM Act, the ACT Legislative Assembly is required to make laws to establish a territory planning authority. The role of this authority is to prepare and administer a territory plan in respect of all land within the ACT, other than designated areas, in a manner that is not inconsistent with the National Capital Plan (NCP).

3.1.2 Planning and Development Act 2007 (PD Act)

The PD Act fulfils the requirements of the PALM Act in establishing the ACT planning and land authority currently known as the EPSDD. The EPSDD is responsible for approving development in all areas of the ACT other than designated areas. The EPSDD administers the Territory Plan, being the primary statutory planning document against which development proposals are assessed. The type of approval process is dependent on the nature of the project and land use zone of the site, as prescribed by the Territory Plan. Development applications are assessed in one of three tracks identified by the PD Act, being code, merit, or impact track.

Under s. 123 of the PD Act, an EIS must be prepared where the impact track applies. The Proposal meets this requirement, as it involves a process or activity specified in Schedule 4 of the PD Act. Consequently, an EIS must be completed prior to a DA being lodged under the impact track. Schedule 4, Part 4.3 of the PD Act identifies areas and processes that require an EIS for development proposals. The following items within Part 4.3, reproduced here in **Table 3.1**, are relevant to the Proposal, requiring the preparation of an EIS.

Table 3.1 *Planning and Development Act 2007* Triggers

Item	Trigger	Proposal
1	*A proposal that is likely to have a significant adverse environmental impact on one or more of the following, unless the Conservator of Flora and Fauna produces an environmental significance opinion that the proposal is not likely to have a significant adverse environmental impact:* *a) a species or ecological community that is endangered* *b) a species that is vulnerable* *c) a species that is protected* *d) a species with special protection status* *e) a species or ecological community if a threatening process has been declared under the Nature Conservation Act 1980, s 38 (4) in relation to the species or community* *f) a species or ecological community if the Flora and Fauna Committee has stated criteria for assessing whether the committee should recommend the making of a declaration under the Nature Conservation Act 1980, s 38 (Declaration of species, community or process) in relation to the species or community)* *g) an endangered species, an endangered population, an endangered ecological community, a critically endangered species, a critically endangered ecological community or species presumed extinct under the Threatened Species Conservation Act 1995 (NSW) if the potential impact of the proposal would be on the species or community in New South Wales.*	The Proposal would impact 1.58 ha of golden sun moth (*Synemon plana*) habitat; a critically endangered species listed under the EPBC Act. It is noted that the EPBC Act Listing Status for the species was amended to vulnerable in December 2021. As the Scoping Report was issued while the species was listed as critically endangered, and no updated conservation policy advice has been issued by DAWE, the impact assessment of the Proposal on golden sun moth has not been amended in this revised EIS. As such, this is considered to be a significant impact to the species, as the available habitat is small and fragmented (i.e. less than 10 ha) and according to the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA, 2009), any habitat loss is considered significant in such areas. The Proposal was referred to the former DoEE in October 2017 (EPBC 2017/8074). It was determined on 19 December 2017 to be a controlled action requiring assessment under the Bilateral Agreement with the ACT. Further detail is provided in **Section 16.0**.
6	*A proposal that is likely to have a significant adverse impact on the heritage significance of a place or object registered under the Heritage Act 2004, unless—* *a) the heritage council produces an environmental significance opinion that the proposal is not likely to have a significant adverse impact; or* *b) the proposal is the demolition of a building that is affected residential premises, and the heritage council has approved a statement of heritage effect in relation to the proposal.*	The Canberra Brickworks Heritage Impact Statement (Lovell Chen, 2022) determined that the Proposal would have an overall positive heritage impact on the CBP, so this trigger no longer applies. Refer to **Section 17.0**.

Item	Trigger	Proposal
7	*A proposal involving land included on the register of contaminated sites under the Environment Protection Act 1997 unless the authority produces an environmental significance opinion indicating that the proposal is not likely to have a significant adverse environmental impact.*	The site is listed on the register of contaminated sites. Refer to **Section 18.0**.

On the basis of these triggers, the Proposal falls into the impact track, and accordingly an EIS must be prepared. A Scoping Document, as required under Part 8 of the PD Act, was provided by EPSDD for this EIS, outlining the items which the EIS must address. The final Scoping Document is provided in **Appendix A**.

3.1.3 Planning and Development Regulation 2008

The Planning and Development Regulation 2008 provides the requirements for the preparation of EIS documentation, including:

- The minimum information list that is required in EIS documentation.
- Requirements for EPSDD and other agency input in relation to the preparation and referral of scoping documents for an EIS, including applicable timeframes.
- Minimum contents for a scoping document for an EIS.
- Criteria for consultants that may prepare an EIS.

3.1.4 Environment Protection Act 1997 (EP Act)

The EP Act was established to protect the environment from pollution and its effects, and to provide a regulatory framework to reduce and eliminate the discharge of pollutants into the air, land and water. The EP Act also establishes the Environment Protection Authority (EPA) as the statutory decision-maker for environmental regulation and policy. The EPA administers legislation covering air and water quality, waste, contaminated land, noise, pesticides, and hazardous waste through the provisions of the Environment Protection Regulation 2005 (EP Regulation).

The EP Act also includes a number of detailed objectives designed to protect the environment; it recognises that environmental decision-making must have appropriate regard for economic and social considerations. The EP Act, when made in 1997, embodied the ecologically sustainable development principles endorsed by the Intergovernmental Agreement on the Environment, to which the ACT is a signatory.

3.1.5 Emergencies Act 2004

The *Emergencies Act 2004* was developed in response to the Report of the McLeod Inquiry into the operational response to the January 2003 bushfires in the ACT. The Act consolidates all previous emergency legislation in the ACT, provides for different declarations in an emergency or impending emergency, and provides for the ACT Bushfire Council as an advisory body to the Minister for Police and Emergency Services.

The ACT's primary bushfire planning instrument, the Strategic Bushfire Management Plan (SBMP) is administered under the *Emergencies Act 2004*. The SBMP establishes the basis and framework for the efficient, effective, and comprehensive management of fire and fire-related activities for protecting human life, property, assets and the environment.

3.1.6 Heritage Act 2004

The purpose of the *Heritage Act 2004* is to provide for the recognition, registration and conservation of places and objects of natural and cultural significance in the ACT.

The ACT Heritage Council is an independent body established under the Act, which has the role of providing advice on appropriate conservation of cultural, natural, and Aboriginal heritage places and objects throughout the ACT. Under the *Heritage Act 2004* the ACT Heritage Council is responsible for keeping a register of places and objects in the ACT which have heritage significance at the Territory level. A place or object must meet at least one of the heritage significance criteria outlined in the Act to be entered in the Heritage Register. The criteria are:

- Importance to the course or pattern of the ACT's cultural or natural history.
- Has uncommon, rare, or endangered aspects of the ACT's cultural or natural history.
- Potential to yield information that would contribute to an understanding of the ACT's cultural or natural history.
- Importance in demonstrating the principal characteristics of a class of cultural or natural places or objects.
- Importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT.
- Importance in demonstrating a high degree of creative or technical achievement for a particular period.
- Has a strong or special association with the ACT community, or a cultural group in the ACT for social, cultural, or spiritual reasons.
- Has a special association with the life or work of a person, or people, important to the history of the ACT.

The heritage significance of the Canberra Brickworks is recognised through the two heritage listings for the 'Yarralumla Brickworks'[4] and the 'Yarralumla Brickworks Railway Remnants' on the ACT Heritage Register.

[4] This listing includes the built structures and geological features of the CBP: https://www.environment.act.gov.au/__data/assets/pdf_file/0008/148517/440.pdf

Amendments made to the *Heritage Act 2004*, passed on 25 September 2014, formally adopted the National Heritage Convention (HERCON) criteria for assessing heritage significance. The model criteria were developed in 1998 at HERCON and form common criteria adopted by the Environment Protection and Heritage Council of the Australian and State/Territory governments in 2008. Prior to the adoption of the HERCON common criteria each jurisdiction in Australia had developed their own heritage assessment criteria, often forming part of legislation or regulation.

Under the Act, the ACT Heritage Council may direct a public authority to prepare a CMP for a place or object for which the authority is responsible. If directed to prepare a CMP, it is the responsibility of the authority to ensure that it is completed to a standard which receives approval from the Council. The SLA was directed to prepare a CMP for the CBP. The CMP for the Proposal was approved by the ACT Heritage Council in August 2021. Further information on the approved CMP is provided in **Section 17.3.3**.

Under s.61G of the Act, 'a person or entity proposing to undertake an activity that is likely to diminish the heritage significance of a place can apply to the ACT Heritage Council for approval of a Statement of Heritage Effects (SHE).' Under s.61H, the Council must approve the SHE if (in summary) the proposal meets the below criteria.

Table 3.2 s.61H Criteria Response

s.61H Criteria	Proposal Response
The proposal is justifiable	The Proposal would facilitate the adaptive reuse and interpretation of the existing CBP, which would provide a means of active conservation, to be celebrated and shared with residents of Yarralumla and Canberra more broadly. Without the use and interpretation of the Proposal Area, the CBP is likely to deteriorate to a point beyond repair.
There are no reasonably practicable alternative ways to carry out the proposal, and	The Proposal has undergone an extensive tender evaluation process to determine the most appropriate response to revitalising and adaptively reusing the CBP. Specific design features are still under review and subject to approval by the ACT Heritage Council. The Proposal must ensure that the Proposal Area is habitable and safe for human occupation and visitation. The Proposal seeks to create a balance between this requirement, creating an ecologically sustainable development and conserving the heritage significance of the CBP. It is considered that the Proponent has taken all reasonable steps to create this balance and to celebrate the heritage of the Proposal Area. No reasonably practicable alternative is considered to be viable.
The applicant has identified reasonable steps it will take to reduce the risk of diminishing the heritage significance of the heritage site.	The Proponent is committed to implementing appropriate and effective management measures to ensure that the heritage significance of the CBP is not diminished. This is further discussed in **Section 17.0**.

Two SHEs have been prepared to date—for the proposed Masterplan and Development Design Strategy (2017) and for the Geotechnical Investigations (2019) (Appendix F37 in **Appendix F**). A revised SHE will be lodged for approval by the ACT Heritage Council prior to submission of detailed development applications. Individual SHEs will also be prepared for each individual, stage development of the Proposal. However, the proposal is considered to broadly meet the requirements of the Act.

This Act has been considered in this EIS through the assessment of the heritage values of the Proposal Area and potential impacts of the Proposal on the heritage significance of the CBP (refer to **Section 17.0**).

3.1.7 Nature Conservation Act 2014 (NC Act)

The NC Act is the primary legislation for the protection of native plants and animals in the ACT, and for the management of the conservation reserve network. The Act establishes the ACT Conservator for Flora and Fauna, the ACT Parks and Conservation Service and other various committees. The Act also lists threatened native species and ecological communities, outlines the requirement for action plans for declared threatened species and ecological communities, provides a regime for offences, licences, and penalties; and also outlines monitoring, compliance and enforcement activities.

Due to the highly disturbed nature of the site due to past land uses, no uncommon, rare, or endangered flora species or ecological communities have been identified within the Proposal Area. However, habitat for the golden sun moth (a NC Act endangered fauna species) is known to occur near the entrance to the CBP in three small patches of exotic grassland. The impacts of the Proposal on this species are discussed further in **Section 16.0**.

3.1.8 Tree Protection Act 2005 (TP Act)

The TP Act sets out provisions for the protection of trees in the urban area. The TP Act contains provisions for:

- Establishment of a register of trees of high importance with appropriate levels of protection.
- Establishment of comprehensive tree protection measures to be applied in areas where urban forest values are at risk of degradation.
- Approval of tree damaging activities.
- Approval of groundwork activities within the tree protection zone of a protected tree.
- Approval of tree management plans.
- Offence and enforcement provisions.
- Ability for the Conservator of Flora and Fauna (the Conservator) to make directions with regard to tree protection matters.
- Establishment of a Tree Advisory Panel (the Conservator is established under the NC Act).

It is proposed that the majority of the trees be removed from the Proposal Area. Two Tree Assessments (dsb Landscape Architects, 2015 and 2020) (refer to Appendix F10 in **Appendix F**) have been undertaken and have determined the majority of trees within the Proposal Area are of poor condition. The predominant tree species within the Proposal Area is Monterey Pine (*Pinus radiata*), along with Ponderosa pine (*Pinus ponderosa*) and Scots pine (*Pinus sylvestris*). Impacts to landscape trees are further discussed in **Section 9.0** of this EIS.

3.1.9 Climate Change and Greenhouse Gas Reduction Act 2010 (CCGHGR Act) and Interim Targets Determination 2018

The CCGHCR Act seeks to promote the development of policies and practices to address climate change, to set targets to reduce greenhouse gas emissions in the ACT, and to provide for monitoring and reporting to the targets established.

Section 6(1) of the Act sets the principal target of reducing greenhouse gas emissions to achieve net zero emissions by 30 June 2050. Section 7(1) of the Act sets an interim target of reducing greenhouse gas emissions to 40% less than 1990 emissions by 30 June 2020. Section 7(2) of the Act allows the Minister to determine additional interim targets by disallowable instrument. The Interim Targets Determination 2018 provided additional interim targets in accordance with Section 7(2).

The Interim Targets Determination 2018 imposed revised targets that better aligned with the emission reductions needed to implement the Paris Agreement.

The ACT's current targets are to reduce greenhouse gas emissions (from 1990 levels) as follows:

- 40% by 2020
- 50 to 60% by 2025
- 65 to 75% by 2030
- 90 to 95% by 2040, and
- 100% (net zero emissions) by 2045.

These are some of the most ambitious targets in both Australia and the world. The adoption of these targets was based on advice from the ACT Climate Change Council. The Proposal has considered the CCGHGR Act and has committed to achieving five stars under the Green Star Communities v1.1 rating tool for the proposed redevelopment. This is further discussed in **Section 12.0** of this EIS.

3.1.10 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The Commonwealth EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. Under the EPBC Act, approval is required from the Commonwealth Minister for the Environment where an action is:

- likely to have a significant impact on a matter of national environmental significance (MNES); or
- likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or action on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

MNES include:

- World heritage properties
- National heritage properties
- Wetlands of international importance
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining), and
- A water resource, in relation to coal seam gas development and large coal mining development.

The Proposal was referred to the former DoEE (EPBC 2017/8074, refer to **Appendix C**) in October 2017 in relation to its potential impact on the critically endangered golden sun moth. It is noted that the listing status of golden sun moth was revised to vulnerable in December 2021. As no further conservation advice has been issued by DAWE at the time of preparing this revised EIS, the impact assessment of the Proposal on golden sun moth has remained unchanged. However, the species is now referred to as 'vulnerable' throughout this document.

On 19 December 2017, it was determined that the Proposal was a controlled action in accordance with s. 75 of the EPBC Act, and was to be assessed under the Bilateral Agreement with the ACT. The Proposal is consequently required to address the matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulation 2000, as outlined within the Scoping Document under the PD Act.

An assessment of impacts to golden sun moth is provided in **Section 16.4.1**.

3.1.11 Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (ATSIHP Act)

The ATSIHP Act allows the Commonwealth Minister for the Environment, on the application of an Aboriginal person or group of persons, to make a declaration to protect an area, object or class of objects from a threat of injury or desecration. The ATSIHP Act was passed to enable the Commonwealth an opportunity to intervene and, where necessary, preserve and protect areas and objects of particular significance to Aboriginal or Torres Strait Islander peoples.

There are no known Aboriginal heritage objects or places within the Proposal Area.

3.1.12 Native Title Act 1993 (NT Act)

The NT Act aims to provide a national system for the recognition and protection of native title and for its co-existence with the national land management system. The purpose of Native Title is to recognise the rights and interests of Aboriginal and Torres Strait Islander people in land and waters according to their traditional laws and customs. Native Title only recognises the right to perform certain activities which come from traditional laws and customs but does not recognise those traditional laws and customs themselves. These activities may include the right to camp, hunt, use water, hold meetings, perform ceremonies and protect cultural sites.

There are no Native Title claims within the Proposal Area.

3.2 Bilateral Agreement Process

The Bilateral Agreement between the Commonwealth Government and the ACT Government, made under s. 45 of the EPBC Act, allows for the accreditation of ACT assessment processes (listed in Schedule 1 of the Bilateral Agreement) to provide an integrated and coordinated approach to the assessment of actions requiring approval from both the Commonwealth Minister (under the EPBC Act) and the ACT Minister (under the PD Act). The Bilateral Agreement does not cover development approvals and accordingly, separate development applications will be required for both the Commonwealth and Territory ministers.

The process for preparing an EIS under the Bilateral Agreement is demonstrated in **Figure 3.1**. Under the Bilateral Agreement process, the Proposal is assessed by both the Commonwealth and ACT Environment Ministers, respectively. Where the Proposal is approved by both Ministers, a DA can then be submitted under the ACT Impact Track. The DA would be assessed according to Division 7.2 and 7.3 of the PD Act.

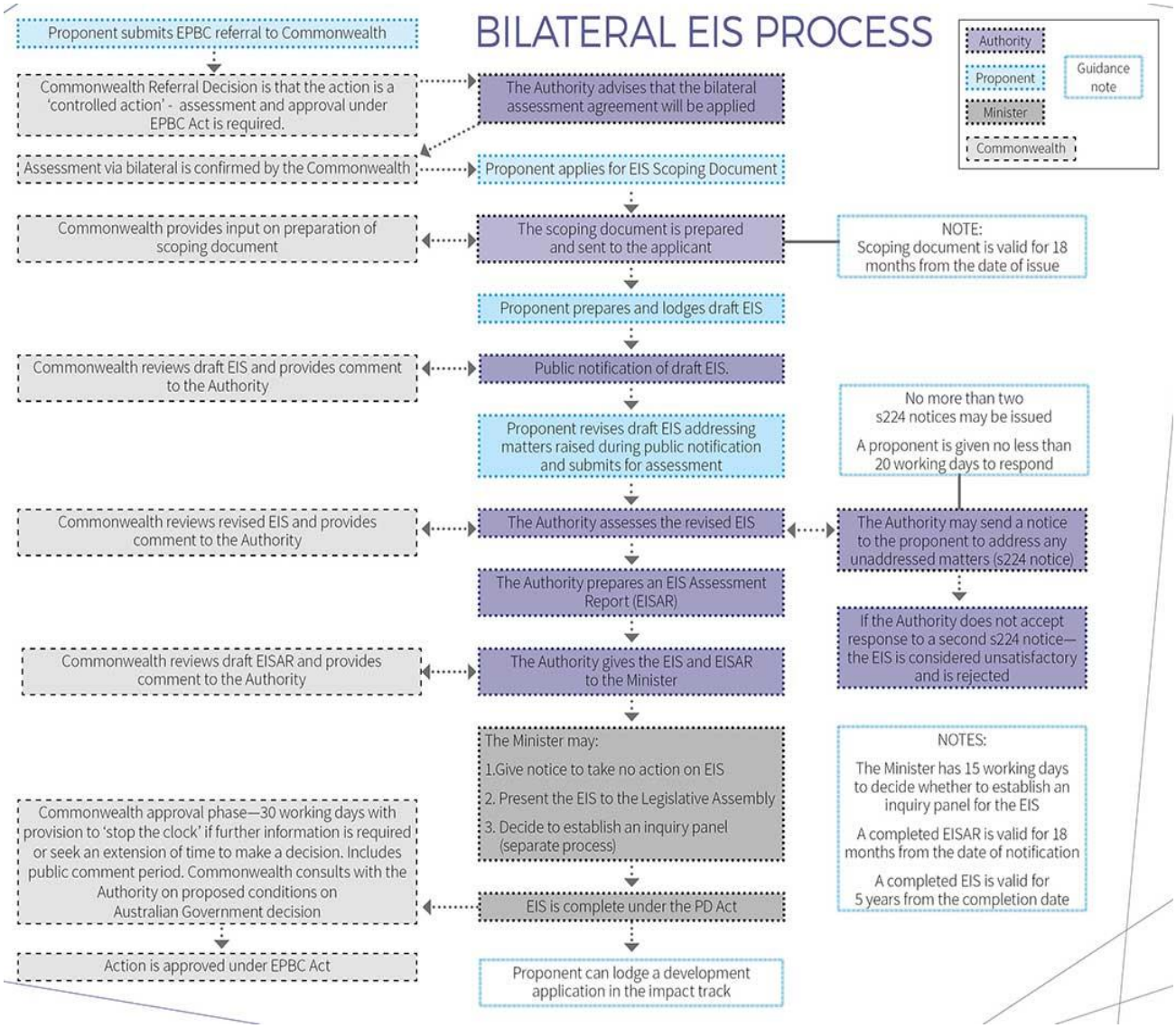


Figure 3.1 Bilateral EIS Process

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Table 3.3 provides a summary of the approval requirements for the Proposal and their associated authority and documentation.

Table 3.3 Summary of Approval Requirements and Authorities

Approval	Authority	Documentation Required
EIS and Impact Track DA	EPSDD	Request for Scoping Document Draft EIS Revised EIS Estate Development Plan Impact Track DAs
EPBC Approval for a controlled action	DAWE	Complete EIS (prepared under the Bilateral Agreement)
Remediation works DA	EPSDD, EPA	RWP SMP DA
Environmental Protection Agreement	EPSDD, DAWE	CEMP and sub-plans OEMP and sub-plans
Endorsement of CMP and Unanticipated Finds Protocol	ACT Heritage Council	CMP Unanticipated Finds Protocol

3.3 Strategic Direction

In addition to the legislation discussed above, the following plans, guidelines and policies have been considered in the preparation of this EIS.

3.3.1 National Capital Plan

The NCP aims to ensure that development within Canberra and the ACT generally occurs in a manner that is appropriate to its role as the nation's capital. The NCP is the strategic plan for Canberra and the Territory to ensure that developments are planned in accordance with national significance recognising the unique purpose, setting, character and symbolism of Australia's national capital. The NCP seeks to provide a framework for development with regards to planning and design, while advancing those aspects of Canberra and the Territory that are important to its national role. The NCP is administered by the NCA, and provides a framework for the Territory Plan, which provides more specific guidance on the development of the region (refer to **Section 3.3.2**).

In accordance with s. 10 of the PALM Act, the NCP sets out the broad planning principles and policies for Canberra and the Territory, and detailed conditions of planning, design and development for the 'designated areas' because of their particular importance to the special character of the national capital. Any buildings, structures, demolition, landscaping or excavation works in these designated areas require the prior written approval of the NCA.

The CBP is not within a designated National Capital Land area, and therefore the Proposal does not require a Works Approval from the NCA. However, it is noted that the immediate surrounding areas to the north, west and south of the Proposal Area are identified as designated capital land under the NCP as part of the National Capital Open Space System associated with Lake Burley Griffin and Foreshores.

3.3.2 Territory Plan 2008

The Territory Plan is the primary statutory planning document in the ACT. The purpose of the Plan is to manage land use change and development in a manner consistent with the strategic directions provided by the ACT Government, Legislative Assembly and the community. The Territory Plan includes a statement of strategic directions, a map which sets out zones and precincts within the ACT, objectives and development tables applying to each zone, and a series of general, development and precinct codes.

Land within the ACT is divided according to sections and blocks, which are zoned as to the type of development that is permissible on each block. The Proposal Area is zoned CZ6 Leisure and Accommodation, with a small portion in the north-eastern corner zoned RZ1 Suburban (refer to **Figure 2.1**). According to s. 4.1 of the Territory Plan, development for the purposes of residential use is prohibited within the CZ6 Zone. However, under the YPMC, additional uses are permitted within the CZ6 zone for the CBP (refer to **Section 3.3.4**), including 'business agency', 'office' and 'residential use'. As such, all uses proposed for the CBP are permissible under the Territory Plan.

3.3.2.1 Territory Plan Strategic Directions

Section 2.1 of the Territory Plan provides a Statement of Strategic Directions, which sets out the principles for giving effect to the objects of the Territory Plan. The Statement includes the principles for sustainable development as well as the spatial planning and urban design principles that are intended to guide the more specific policy content of the Territory Plan.

The design principles are intended to guide the planning and development of the ACT and relate to sustainable development (economic, social and environmental sustainability) in addition to spatial planning and urban design, to achieve the desired outcomes for future development of land and transport within Canberra. The Proposal would meet all relevant strategic directions identified in s. 2.1 of the Territory Plan. Where applicable, these principles have been considered during the design and development of the Proposal, and cross-references to the applicable EIS section are shown in **Table 3.4** below.

Table 3.4 Territory Plan Strategic Directions

Strategic Direction (Section 2.1 Territory Plan)	CBP Response
1. Principles for Sustainable Development ***General Principles*** *1.1 Planning processes and decisions would be focused on the combined achievement of economic vitality, community wellbeing and environmental quality. Broad community involvement would be a key element in the pursuit of sustainable development, as would complementary regional strategies and agreements.*	Refer to **Section 3.4** Ecologically Sustainable Development
1.2 Matters of broader National Capital, metropolitan and regional significance would be carefully considered when formulating Territory Plan policies and when making decisions about development proposals and sequencing.	
1.3 Economic, social and environmental objectives would be pursued in a balanced and integrated way, having regard to both short-term and long-term factors, such that present needs can be met without prejudicing the welfare of future generations, and without serious or irreversible loss of life-supporting natural resources or damage to the environment.	
1.4 Wherever appropriate, the broader global and regional context and potential cumulative impacts of decisions would be taken into account. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for failing to prevent environmental degradation.	
Environmental sustainability *1.5. Planning policies would seek to ensure the efficient use of all resources and to reduce consumption of non-renewable resources. Waste minimisation, reuse and recycling would be encouraged, whilst energy-rating and conservation measures would be applied wherever appropriate, particularly in transport, subdivision planning, and building design and construction.*	Refer to **Section 8.0** Materials and Waste
1.6 The pattern of development is to reflect land capability constraints resulting from topography, soils, geotechnical factors, drainage, natural hazards, microclimate and the sensitivity of ecosystems. Particular attention would be given to the need to conserve soil, water and vegetation; maintain biological diversity; safeguard important ecosystems and ecological processes; and provide and protect wildlife corridors.	Refer to **Section 10.0** Water Quality and Hydrology, **Section 14.0** Hazard and Risk, **Section 15.0** Soils and Geology, **Section 16.0** Ecology and Natural Environment, and **Section 18.0** Contamination
1.7 Land and water resources would be planned in accordance with the principles of integrated catchment management and water sensitive urban design. Policies would seek to protect identified environmental values, whilst focusing on opportunities for multi-purpose use of resources. Special attention is to be given to protecting sources of the Territory's water supply and to maintaining environmental flows in rivers and streams	Refer to **Section 10.0** Water Quality and Hydrology

Strategic Direction (Section 2.1 Territory Plan)	CBP Response
1.8 Planning policies would provide for the sustainable management of rural areas, ensuring that rural lands nominated for future urban development or other purposes can be retained in productive use and properly managed for the time being. Appropriate activities to reduce net greenhouse gas emissions would be encouraged.	Not applicable
1.9 Urban expansion would be contained in order to minimise impacts on valuable natural and rural areas.	Refer to **Section 5.0** Land Use and Planning
1.10 Integrated land use and transport planning would seek to maximise accessibility and transport efficiency, prioritise active travel, reduce energy consumption, increase physical activity, support the preferred pattern of development, promote safety, safeguard environmental quality, and minimise greenhouse gas emissions.	Refer to **Section 7.0** Traffic and Transport
1.11 Policies for environmental planning and management would ensure amenity, minimise pollution, and protect public health and safety.	Refer to **Section 9.0** Landscape and Visual, **Section 11.0** Socio-Economic, Health and Recreation and **Section 12.0** Climate Change and Air Quality
Economic sustainability *1.12 Planning policies would facilitate the widest possible range of commercial, retail, industrial, rural, tourism, and other forms of economic activity in order to promote new investment and a more diversified economy, to underpin employment growth, and to respond to changing economic opportunities.*	Refer to **Section 5.0** Land Use and Planning
1.13 The characteristics of the city that contribute to economic growth: Canberra's role as the national capital and the seat of Federal Parliament; the ease of getting around the city; the safe and clean environment; and the vibrancy of centres as places of social, cultural and business exchange, would be enhanced.	
1.14 An adequate and diverse supply of industrial land would be maintained to facilitate both conventional and new forms of industry.	Not applicable
1.15 Tourism would be fostered by permitting a variety of entertainment, leisure and accommodation facilities, including opportunities for ecotourism, in appropriate locations throughout the Territory.	Refer to **Section 11.0** Socio-Economic, Health and Recreation
1.16 Sufficient land would be set aside for major communications, educational, scientific, or other activities requiring broadacre sites in appropriate locations outside urban areas.	Not applicable

Strategic Direction (Section 2.1 Territory Plan)	CBP Response
1.17 In planning future development and redevelopment, particular emphasis would be placed on cost-effective provision and management of existing and new infrastructure and services, taking into account whole-of-life and whole-of-system costs, including the ecological footprint of proposed developments and activities.	Refer to **Section 3.4** Ecologically Sustainable Development
Social sustainability *1.18 Provision would be made for a comprehensive range of readily accessible community, cultural, sporting and recreational facilities, distributed according to the varying needs of different localities and population groups. In major centres and developing areas, sites would be safeguarded where necessary for particular community needs.*	Refer to **Section 11.0** Socio-Economic, Health and Recreation
1.18A Development is planned to promote active living through the following six principles: *a) providing connectivity between uses and activity nodes* *b) preserving open space* *c) encouraging mixed land use and density* *d) ensuring public places are safe and attractive for all* *e) providing supportive infrastructure that encourages regular physical activity* *f) ensuring environments promote social inclusion, and are equitable and where practicable are accessible by all.*	
1.19 A variety of open space types would be provided in each district or local area to meet the diverse recreational needs of residents and visitors, and to contribute to community health.	
1.20 Planning policies for community facilities and open space would encourage multiple use and flexible design to allow for changing needs.	
1.21 Provision of affordable, adaptable and special-needs housing would be promoted throughout the city, as well as modification or redevelopment of existing stock to meet emerging social needs.	
1.22 Urban development would be planned in a manner that promotes community vitality and safety, applying principles of crime prevention through environmental design. Provision would also be made for emergency services infrastructure necessary to ensure a high standard of safety for residents and visitors.	
1.23 The needs of people with disabilities would be recognised in all facets of urban planning, particularly including the design and operation of transport and access systems and the assessment of development proposals.	Refer to **Section 7.0** Traffic and Transport

Strategic Direction (Section 2.1 Territory Plan)	CBP Response
1.24 All new developments and re-developments would be planned with appropriate and segregated network facilities for pedestrians and cyclists; provision for accessible public transport; a legible and permeable hierarchy of roads; conveniently located commercial and community facilities; and a network of open spaces.	
1.25 Heritage and cultural values would be safeguarded, including in particular those of the Territory's Aboriginal peoples and those derived from both its rural history and urban development as the National Capital. The distinctive qualities of residential areas and other places, as well as elements of community heritage, would also be recognised and their conservation promoted.	Refer to **Section 17.0** Aboriginal, European and Natural Heritage
1.26 Identified places of heritage significance would be protected in accordance with requirements for their conservation contained in the Heritage Register and any relevant heritage guidelines under the Heritage Act 2004. Special provisions are included in the Heritage Act for the recognition, registration and conservation of Aboriginal heritage.	
2. Spatial Planning and Urban Design Principles ***Urban areas*** *2.1 Canberra would continue to develop as a series of discrete urban areas within a landscape setting of hills, ridges and other open spaces. Each town would offer a diversity of housing types; the broadest possible range of employment opportunities; and convenient, linked access prioritising active travel to centres, community facilities and open space*	Refer to **Section 5.0** Land Use and Planning
2.2 Future residential settlement would be accommodated through development of greenfields areas, subject to detailed feasibility and suitability studies; some expansion of existing towns; and appropriate use of suitable vacant or underdeveloped sites.	
2.3 Commercial and retail activity would be concentrated in centres and other planned nodes of intensive activity that are well served by public transport to ensure an efficient pattern of development. Primary emphasis would be placed on strengthening and enhancing existing and new centres and nodes, including improved urban design and encouragement of more mixed-use development.	
2.4 Planning policies would support revitalisation of the City Centre as the preeminent centre of governance, commerce and entertainment for the ACT and its region, while keeping the City Centre in appropriate balance with other town centres. Within the City Centre, provision would also be made for a range of major community facilities and opportunities for high-density residential development.	
2.5 A wide range of housing types would be permitted in identified residential areas close to centres and major transport routes to increase choice; maximise opportunities for affordable housing; and secure some intensification of development consistent with maintaining residential amenity. Outside of these areas, planning policies would protect the typically low density, garden city character of Canberra's suburban areas.	

Strategic Direction (Section 2.1 Territory Plan)	CBP Response
2.6 Higher density development would be encouraged within and near major centres, and in other suitable locations that are well served by public transport	
2.6A Development would provide suitable and well-designed supportive infrastructure that enhances the experience of the urban environment for people of all abilities and encourages and supports regular physical activity.	
2.7 Development would be planned to encourage use of public transport, walking and cycling, including commuter cycling. Routes would be reserved for an enhanced inter-town public transport system. Requirements for vehicle parking would be related to commercial needs and transport policy objectives.	Refer to **Section 7.0** Traffic and Transport
2.8 Industrial areas would be in locations accessible to suitable freight services, and where industrial activity is unlikely to have a significant adverse effect on the environment or the amenity of residential areas.	Not applicable
2.9 A planned hierarchy of roads would be maintained in order to promote road safety, protect the amenity of residential and commercial areas, and facilitate the efficient movement of major traffic flows and heavy vehicles.	Refer to **Section 7.0** Traffic and Transport
2.10 Adequate provision of open space throughout the Territory would remain a high priority. Open space would be planned and carefully maintained as an integrated, hierarchical system that provides for a diversity of sport and recreation activities, contributes to the legibility and character of urban development, is cost-effective to maintain, and assists in the effective management of stormwater.	Refer to **Section 5.0** Land Use and Planning and **Section 11.0** Socio-Economic, Health and Recreation
Non-urban areas *2.11 Planning policies would protect the landscape and environmental qualities of the hills and ridges surrounding urban areas, the Murrumbidgee and other river corridors, the mountains and forests west of the Murrumbidgee River, and productive rural landscapes.*	Refer to **Section 9.0** Landscape and Visual
2.12 Planning for non-urban and natural areas would also recognise the values of land for research, education, recreation and tourism purposes.	Not applicable
2.13 Clearance zones would be established where necessary around major facilities to protect the operational efficiency of those facilities and to minimise adverse environmental impacts.	Not applicable

Strategic Direction (Section 2.1 Territory Plan)	CBP Response
Urban Design *2.14 Policies and procedures to promote high quality, creative design of development, urban spaces and landscape settings would be applied throughout the Territory, and innovation encouraged, in keeping with the spirit of the National Capital as an exemplar of best practice. Particular care would be taken to ensure high-amenity, quality design outcomes within residential areas, heritage areas, major centres and activity nodes, and along principal approach routes. The relationship between the public and private realms would also be emphasised in terms of the design quality of precincts and shared spaces, including spaces around buildings, as well as that of individual developments.*	Refer to **Section 5.0** Land Use and Planning, **Section 9.0** Landscape and Visual and **Section 11.0** Socio-Economic, Health and Recreation
2.15 Policies would acknowledge Canberra as the national capital and the symbolic heart of Australia and would seek to preserve the landscape features that give the national capital its character and setting; respect and reinforce the key elements of Walter Burley Griffin's formally adopted plan for Canberra within the proposed urban settlement pattern; enhance and strengthen approaches and backdrops to the city and its national institutions; conserve open space between urban areas as visual separation buffers consistent with the landscape setting; retain areas that are identified as the rural setting surrounding the city; and retain key vistas created by the landscape network within new settlement areas.	
2.16 Retention of Canberra's unique landscape setting, including the integration of natural and cultural elements that create its 'garden city' and 'bush capital' qualities, would be accorded the highest priority. Special attention would be given to safeguarding visual amenity, protecting vegetation and other important features within the established urban landscape, and ensuring the high quality of environmental design in new developments or redevelopment.	
2.17 Advertisements and signs would be carefully controlled to maintain environmental amenity.	Noted – fixed signage will require development approval in accordance with the Signs General Code within the Territory Plan

3.3.3 ACT Planning Strategy 2018

The ACT Planning Strategy is a key strategic planning document within the ACT, providing a framework for spatially based development decision-making and identifying actions required to achieve its strategic goals over a 30-year period. The Strategy operates alongside the Territory Plan and the NCP, providing direction for land use and construction of capital works in the short, medium and long term.

The 2012 ACT Planning Strategy was highly influential in shaping Canberra under its vision to facilitate a balance between urban renewal and new development areas. The 2012 strategy succeeded, with urban infill making up approximately 60% of new housing in 2018. Building on the strong foundations of the 2012 strategy, the ACT Planning Strategy 2018 incorporated community views expressed during consultation to provide a clear, robust and contemporary urban planning framework based on five themes that would deliver on a vision for a sustainable, competitive and equitable Canberra.

The themes, and the way in which the Proposal responds to them, are outlined in **Table 3.5** below.

Table 3.5 Planning Strategy Themes

Theme	CBP Alignment
1. Compact and efficient city ○ *Grow mostly within our urban footprint or in areas close to our footprint* ○ *Maintain environmental values* ○ *Use infrastructure effectively to support an efficient, sustainable and liveable city.*	The CBP is situated within/adjacent to the existing urban footprint. The CBP is within convenient access to Civic, Woden Town Centre, Curtin Group Centre and Yarralumla and Deakin local shops. The proposed CBP would also contain a mixture of retail and commercial uses, auxiliary facilities for residents and industrial crafts/artisan uses. The proposed CBP redevelopment would provide a range of housing choices with direct access to open space.
2. Diverse Canberra ○ *Celebrate our culture, uniqueness and difference* ○ *Be innovative and continue to diversify* ○ *Support a city structure that strengthens our economy, and the economy of the region.*	The proposed CBP redevelopment would provide housing diversity to meet changing household composition, age and cultural diversity and universal access principles. Master planning for the CBP has utilised a place-making approach tailored to increase participation and capitalise on community strengths. The CBP would provide mixed use land uses, allowing for close to 8,000 m^2 of commercial and retail space to house a range of retail and commercial uses.
3. Sustainable and Resilient Territory ○ *Adapt to a changing climate and establish resilience in our built forms, infrastructure and natural assets* ○ *Look after natural resources* ○ *Support the transition to net zero carbon emissions by 2045.*	As urban infill, the CBP would make more efficient use of existing infrastructure and promote a more compact and sustainable city. It would also improve transport, pedestrian and cycle linkages throughout the Yarralumla area. The CBP would utilise innovative estate design to optimise solar orientation for blocks and promote water sensitive urban design. The proposed redevelopment would also be designed to meet the requirements of the GBCA Green Star Adaptation and Resilience accreditation. The Proposal will be designed to have a 5-star rating under the Green Star Communities v1.1 rating tool. This is further discussed in **Section 12.0** of this EIS.

Theme	CBP Alignment
4. Liveable Canberra ○ *Create cohesive communities through good design, amenity and connectivity* ○ *Be socially and culturally inclusive* ○ *Support housing diversity for greater choice.*	The proposed CBP redevelopment would contain 380 dwellings, including a mix of houses, townhouses, and small and large apartments incorporating high-quality design and built form. The CBP would integrate high-quality urban parkland accessible to the Canberra community, particularly through the proposed Quarry Parklands.
5. Accessible Canberra ○ *Provide equitable access to all that the city has to offer* ○ *Include more options to move around in a connected and fair city* ○ *Better integrate land use and transport planning.*	The CBP is in close proximity to the Adelaide Avenue and Cotter Road rapid transport routes. This route is also proposed to accommodate the Civic to Woden alignment of the Canberra Light Rail.[5] The masterplan for the CBP redevelopment aims to deliver well-designed, safe, and sustainable streets and public spaces to create a walkable neighbourhood. The CBP would connect to existing open space and green corridors within the Yarralumla area, including existing walking tracks surrounding the Royal Canberra Golf Club through to Weston Park. The CBP would also create publicly accessible parkland, providing greater continuity of green space throughout the area.

3.3.4 Yarralumla Precinct Map and Code

The YPMC (EPSDD, 2012b) provides additional planning, design and environmental controls for specific areas or blocks within the Division of Yarralumla.

Under the Yarralumla Precinct Map and Code, additional uses are permitted within the CZ6 zone for the CBP, including 'business agency', 'office' and 'residential use'. As such, all uses proposed for the CBP are permissible under the Territory Plan.

The Yarralumla Precinct Map and Code provides additional rules and criteria for the CBP. These rules relate to maximum gross floor area of shops and offices, and the number of storeys and setbacks of buildings. These additional rules are summarised in **Table 3.6** below.

[5] https://www.transport.act.gov.au/about-us/public-transport-options/light-rail/light-rail-network/Light-Rail-Network-Expansion

Table 3.6 Yarralumla Precinct Map and Code criteria

Rules	Criteria
1.1 SHOP and offices – floor area limit	
R1 The maximum gross floor area is: SHOP except where associated with or related to entertainment, accommodation and leisure uses – 500 m^2 Office – 1,500 m^2	This is a mandatory requirement. There is no applicable rule.
2.1 Number of storeys	
There is no applicable rule.	C2 Buildings achieve all of the following: a) Consistency with the *desired character* b) Scale appropriate to the function of the use c) Minimal detrimental impacts including overshadowing and excessive scale. The maximum number of storeys is: a) *RESIDENTIAL USE* – 3 b) In all other uses – 2.
2.2 Setbacks	
R3 The minimum *setback* to the northern and eastern boundaries is 20 m.	C3 Buildings achieve minimal detrimental impacts including overshadowing and excessive scale.

The proposed redevelopment of the CBP would be compliant with all the above rules and criteria, which would be demonstrated in the detailed design, to be submitted during the DA stage.

3.3.5 Yarralumla Neighbourhood Plan

The Yarralumla Neighbourhood Plan was prepared by the ACT Planning and Land Authority in 2004. The Plan seeks to outline the future character of the suburb of Yarralumla, whilst protecting and enhancing existing valued features. Specifically, the Plan provides planning strategies for five key areas:

- The Yarralumla local centre
- Residential areas
- Urban open space
- Community facilities, and
- Movement networks.

In addition to these areas, the Plan provides specific future strategies for the Brickworks Precinct. The Plan notes that, 'The Brickworks has legislative protection for its heritage components, but this does not preclude adaptive reuse of all or part of the site' and mentions its potential use as a precinct for additional housing. It is acknowledged that the ACT Government of the time at which the Plan was written had committed to limiting development within the CBP to approximately 25 dwellings. The ACT Government has since revised this policy, having consideration for the increasing population of the ACT and the need to provide sustainable housing development.

Nonetheless, the Proposal is considered to be consistent with the intent of the Yarralumla Neighbourhood Plan. This is further considered in **Section 5.4** of this EIS.

3.3.6 ACT Sustainability Policy

The ACT Sustainability Policy (2009) provides the guiding principles for the ACT Government's approach to sustainability, and to support its implementation. The policy emphasises the need to balance social, economic, and environmental outcomes, as well as establish a common definition of sustainability. This policy subsequently led to the development of the Triple Bottom Line (TBL) Assessment Framework, which provides a means of identifying and integrating social, environmental and economic factors into the policy development cycle, by ensuring that decisions are informed by assessments of all potential impacts. The TBL Assessment Framework is now considered to be a standing requirement for preparing most types of Cabinet submissions. Refer to **Section 3.4** for further consideration of the principles of ecologically sustainable development in relation to the Proposal.

3.3.7 ACT Indicative Land Release Program 2019–20 to 2022–23

The Indicative Land Release Program (ACT Government, 2019b) provides a four-year outline of the Government's intended program of residential, commercial, industrial, community and non-urban land releases. The programs are indicative only and are subject to change on a yearly basis, depending on market conditions and/or Government priorities.

The Program plays a strategic role in catering for population growth, building a compact, liveable city, attracting investment in the ACT land market, and strengthening the economy of the ACT region. The EPSDD is responsible for preparing the Program in consultation with other ACT Government Directorates. The SLA and City Renewal Authority deliver the programmed land releases.

The Indicative Land Release Program for 2019-20 to 2022-23 was released on 4 June 2019 (along with the ACT Government's Annual Budget). Land release contributes to the financial, social and environmental objectives of the Territory by:

- Delivering affordable housing choices and promoting housing diversity.
- Stimulating urban renewal where it is appropriate and sustainable, and contributing to delivering up to 70% of new housing within our existing urban footprint.
- Balancing a stable supply of land against forecast demand and maintaining an appropriate inventory.
- Meeting the demand for land in the Territory across all sectors and attracting investment into Canberra.

- Supporting a sustainable and competitive land development and construction industry which creates good jobs for Canberrans.

- Achieving satisfactory revenue returns to Government from the sale of unleased Territory land and surplus property assets.

Though the CBP is not specifically identified within the Program, it is apparent that its redevelopment would significantly contribute to the achievement of these objectives. As an urban renewal site that would offer housing diversity and opportunities for retail and commercial investment, the redevelopment of the CBP is anticipated to provide a range of economic, social and environmental benefits to the ACT. This is further discussed throughout this EIS.

3.3.8 ACT Climate Change Strategy 2019-2025

The ACT Climate Change Strategy 2019-2025 (ACT Government, 2019a) brings together emission reduction, resilience and adaptation measures as part of a holistic response to climate change and, together with Canberra's Living Infrastructure Plan: Cooling the City (ACT Government, 2019c) (refer to **Section 3.3.9** below), replaces the previous ACT Climate Change Adaptation Strategy (2016).

The ACT Climate Change Strategy 2019-2025 outlines the next steps the community, business and Government would take to reduce emissions by 50 to 60% (below 1990 levels) by 2025 and establish a pathway for achieving net zero emissions by 2045. The Strategy sets out actions to reduce emissions and to build resilience to climate change impacts. As of 2020, the ACT is powered by 100% renewable electricity. As such, the next key challenge for the Territory is to reduce emissions from transport, gas and waste.

The CBP is consistent with the Strategy as demonstrated by its plan for efficient and sustainable urban land use to reduce emissions and meet the target for net zero emissions by 2045, ensuring infrastructure and services are resilient to climate change impacts, and by developing more climate-ready infrastructure that would help protect against future environmental threats. This is further discussed in **Section 12.4.2**.

3.3.9 Canberra's Living Infrastructure Plan: Cooling the City

Canberra's Living Infrastructure Plan: Cooling the City (ACT Government, 2019c) provides strategic direction to help the city's expanding metropolitan areas become better prepared for, and more resilient to, climate change. The document sets out the ACT Government's firm commitment to maintain and improve living infrastructure in Canberra. Living infrastructure comprises vegetation, soils and water systems which provide shade and space for outdoor recreation, retain water in the landscape and support wildlife and biodiversity. The Plan recognises the critical role that living infrastructure plays in our city, and the increasingly important role it would play, particularly in cooling the city, as the climate warms.

The Plan identifies fifteen actions for the ACT Government to implement:

- *Action 1: Complete inventory and mapping of living infrastructure and expand the public urban infrastructure asset management system to include urban living infrastructure to inform investment decision making, whilst investigating steps to implement an accounting framework, such as the United Nations System of Environmental Economic Accounting (SEEA), to value urban living infrastructure.*

- *Action 2: Achieve 30% tree canopy cover (or equivalent) and 30% permeable surfaces in urban areas by 2045.*

- *Action 3: Prepare a Microclimate Assessment Guide and mandate its use to inform policy and forward planning studies for centres, urban renewal projects and urban intensification precincts, with initial assessment of priority locations to inform a city cooling works program.*
- *Action 4: Introduce requirement(s) for microclimate assessments of significant developments located in centres, urban renewal projects and urban intensification precincts, to assist with development assessment.*
- *Action 5: Prepare a guide for use by the community and built environment professionals to support effective landscape plans, and increase the opportunity for healthy, climate resilient and biodiverse gardens and public lands.*
- *Action 6: Require multi-dwelling, mixed use and commercial development applications (DA) to have landscape plans that demonstrate how surface treatments and tree canopy cover targets will be met, and change the processes for certification of DA compliance accordingly.*
- *Action 7: Expand Actsmart web-based information and programs to incorporate the Climate-wise Landscape Guide to encourage and support community efforts to improve sustainability outcomes.*
- *Action 8: Review and update the ACT Tree Protection Act 2005 to ensure consistency with the objectives of the Plan and suitability to Canberra's changing climate.*
- *Action 9: Develop a strategic plan for the public urban forest that outlines how the urban forest can be maintained and enhanced to improve amenity in a changing climate and deliver biodiversity outcomes.*
- *Action 10: Trial city cooling initiatives in high priority locations.*
- *Action 11: Trial local park upgrades in high priority locations including watered grass, trees, seats, lights and drinking fountains.*
- *Action 12: Support the amenity and safety of active travel on trunk cycle and pedestrian routes with tree canopy shade and water points at key destinations.*
- *Action 13: Showcase best practice climate-wise design through display houses and exhibition sites in Government projects.*
- *Action 14: Support trials and demonstration projects to retrofit infrastructure to allow hydration of open spaces using stormwater.*
- *Action 15: Investigate ways to encourage and incentivise living infrastructure on existing and future buildings in Canberra.*

The CBP redevelopment supports many of the key priorities of the ACT Climate Change Strategy 2019–2025 and Canberra's Living Infrastructure Plan. This is further discussed in **Section 9.0** and **Section 12.0**.

3.3.10 Urban Forest Strategy 2021–2045

The Urban Forest Strategy (ACT Government, 2021) provides a framework for the protection, maintenance and enhancement of Canberra's urban forest. This framework assists in achieving the target of 30% canopy cover or equivalent by 2045.

The Strategy's vision is for all Canberrans to enjoy the benefits of streets lined with healthy trees, and to ensure that Canberra's urban forest is resilient, sustainable and contributes to the wellbeing of the community in a changing climate. The strategy has six key objectives:

1. Protect the urban forest.

2. Grow a resilient forest.

3. Balance and diversify the urban forest.

4. Take an ecological approach to support biodiversity.

5. Develop infrastructure to support the urban forest and liveability.

6. Partner with the community and maintain the urban forest.

The Proposal is consistent with the Strategy's vision and strategy, as demonstrated within the Proposal's draft Landscape Master Plan (refer to Appendix F46 in **Appendix F**). This is further discussed in **Section 9.0**.

3.3.11 ACT Transport Strategy 2020

The ACT Transport Strategy (ACT Government, 2020) outlines the aim of the ACT Government to establish a world class transport system that supports a compact, sustainable and vibrant city. According to the Strategy, a world class transport system encompasses safe, reliable, efficient and attractive transport to serve people's needs now and into the future.

The Strategy provides a framework for planning and investment in transport for the next 20 years. The Strategy was developed alongside the ACT Planning Strategy 2018 and Climate Change Strategy 2019–2025. The Transport Strategy has adopted a vision and direction for the future of zero emissions travel in Canberra. This focus seeks to ensure Canberra's transport network complements the renewal and strengthening of inner precincts and suburbs as well as supporting the reduction of greenhouse gas emissions created through transport.

The Strategy employs four key actions for the ACT Government to bring about its vision:

1. **A future-focused investment framework** – this will aim to provide long-term sustainability to transport solutions. This will involve the continued rebalancing of investment towards public transport, cycling and walking, while continuing to invest in the safety and maintenance of Canberra's road network.

2. **Refocused network planning and design** – this will involve the ACT Government collaborating with partners across Government and the community to employ the Movement and Place framework to weave transport and places together, improving the social and urban fabric of Canberra.

3. **Optimising our infrastructure** – this will involve continuously improving the capability of Canberra's transport infrastructure. The ACT Government will assess the performance of roads and paths and look for new solutions to maximise their use efficiently, sustainably and safely.

4. **An ACT Transport Recovery Plan** – This plan will seek to adapt, improve and innovate Canberra's transport network in response to the COVID-19 pandemic. The ACT Government will seek to deliver world-class public transport, attractive and viable options for cycling and walking, and a safe and efficient road network.

The Proposal is consistent with the ACT Transport Strategy 2020, by providing an integrated road and footpath network throughout the Proposal Area and within the surrounding existing urban environment. While the Proponent is not able to control the provision of public transport in the area, the Proponent has sought to provide sustainable active travel solutions where possible. Further discussion is provided in **Section 7.0**.

3.4 Ecologically Sustainable Development

Section 9 of the PD Act defines sustainable development in the following manner:

> *Sustainable development means the effective integration of social, economic and environmental considerations in decision-making processes, achievable through implementation of the following principles:*
>
> *(a) the precautionary principle*
>
> *(b) the inter-generational equity principle*
>
> *(c) conservation of biological diversity and ecological integrity*
>
> *(d) appropriate valuation and pricing of environmental resources.*

ESD requires that current and future generations should live in an environment that is of the same or improved quality than the one that is inherited. To justify the proposed redevelopment of the CBP with regard to ESD principles, the benefits of the Proposal in an environmental and socio-economic context should outweigh any negative impacts. Details on the consideration of each ESD principle, as defined by s. 9 of the PD Act, in relation to the Proposal are provided below.

3.4.1 The Precautionary Principle

In making decisions about developments, application of the precautionary principle is guided by careful evaluation to avoid, wherever practicable, serious, or irreversible damage to the environment, and an assessment of the risk-weighted consequences of various options.

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Proposal, this EIS has undertaken an evaluation of all the key components. Detailed assessment of all key issues and necessary management procedures has been conducted and is documented in this EIS.

The assessment process has involved a detailed study of the existing environment and the use of engineering and scientific modelling and study to assess and determine potential impacts as a result of the Proposal. To this end, there has been careful evaluation to avoid, where possible, irreversible damage to the environment.

The decision-making process for the design, impact assessment and development of management processes has been transparent in the following respects:

- Relevant government authorities and community representatives were consulted extensively throughout the various stages of the Proposal (refer to **Section 19.0**). This enabled comment and discussion regarding potential environmental and social impacts and proposed management procedures.
- The environmental assessment has been undertaken on the basis of the best available scientific information about the CBP area. Where uncertainty in the data used in the assessment has been identified, a conservative worst-case analysis has been undertaken and contingency measures have been identified to manage that uncertainty.
- All supporting technical reports are based on careful evaluation of the proposed impacts on the environment through measures such as analysis of historic documentation, field surveys and technical modelling. Based on this evaluation, management and mitigation measures have been formulated based on best practice and in accordance with relevant policies and guidelines to avoid serious or irreversible damage to the environment.

3.4.2 Intergenerational Equity

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

The CBP has a history of disturbance, however its redevelopment seeks to promote the adaptive reuse of the site and its surrounds with respect to its heritage significance. Specifically, the redevelopment of the CBP seeks to create and/or promote the following assets for future generations:

- A safe, healthy, and high-quality living environment providing housing diversity on a brownfield site, thus avoiding the development of alternative greenfield sites.
- New employment generation, creative and social opportunities.
- Heritage outcomes which would see significant heritage assets conserved and made open to the public.
- Urban infill development that encourages the efficient use of existing infrastructure and promotes a more compact and sustainable city, as well as improving transport, pedestrian and cycle linkages.

As detailed in **Section 5.0** through **Section 18.0**, the Proposal can effectively avoid or mitigate any potentially significant impacts resulting from the proposed redevelopment of the CBP. The environmental management measures discussed in the following sections have been developed to minimise the impact of the Proposal on the environment and community to the extent reasonably practicable and to maintain the health, diversity and productivity of the environment for future generations whilst also realising the benefits of the establishment of this area as a residential development node.

3.4.3 Conservation and Biological Diversity

The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them.

The environment within the CBP is highly disturbed, primarily a result of the historic use of the site as grazing land prior to its use as a brickworks and associated quarry. Vegetation across the CBP has been heavily modified and is dominated by exotic species including landscaping trees, garden escapees and weeds. Areas near the site boundaries and in the quarry contain a largely self-seeded overstorey – primarily of Monterey pine (*Pinus radiata*) and other related species.

The vegetation within the CBP has no conservation significance. The exotic composition of the vegetation provides limited opportunities for native fauna species, however, small patches of exotic grassland near the entrance to the CBP are dominated by a weed of national significance: Chilean needlegrass (*Nassella neesiana*) which is known to support golden sun moth and has been confirmed as habitat for this species (Biosis, 2017b, Appendix F29 in **Appendix F**). This represents a unique biodiversity management conflict between the needs of a nationally recognised vulnerable species within a habitat dominated by a weed of national significance. This is further discussed in **Section 16.0** of this EIS.

3.4.4 Valuation and Pricing Resources

The goal of improved valuation of natural capital has been included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment. The principle of improved valuation and pricing refers to the need to determine proper values of services provided by the natural environment. The objective is to apply economic terms and values to the elements of the natural environment. This is a difficult task largely due to the intangible comparisons that need to be drawn in order to apply the values.

The Proposal optimises the valuation and pricing of the land resources within the CBP with minimal environmental impact by maximising the efficient use of a brownfield resource. Feasibility considerations during the design process for the CBP redevelopment have included the costs of integration of effective management measures to minimise potential environmental and social impacts. In this way the environmental costs are factored into the pricing of the housing and commercial real estate.

Durability, robustness, coherence with the surrounding environment, considered maintenance requirements and sustainable practice are at the heart of the Proposal.

4.0 Risk Assessment

Section Summary
This Section describes the environmental risk assessment process undertaken for this EIS, and the results that inform the impact assessment for each of the issues as set out in the following sections. This environmental risk assessment is a requirement of the Final Scoping Document and an important step in the assessment of the Proposal's potential environmental impacts. The environmental risk assessment assists in identifying that some issues are of greater concern than others, and therefore require greater consideration. This in turn assists in developing appropriate mitigation measures and management responses, as well as determining potential residual risks.

4.1 Risk Assessment Methodology

The environmental risk assessment for the Proposal has been undertaken with consideration for the principles of the *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines*. By identifying the consequences of an impact and the likelihood of it occurring, the risk of each identified potential impact is categorised according to the matrix provided in **Table 4.1** below. The probable effectiveness of the proposed mitigation measures is then considered to determine the residual risk of each impact.

As such, the risks associated with the potential impacts are analysed as a function of the likelihood of the risk occurring, the consequences associated with this risk occurring, and the effectiveness of the control systems in place to address the risk. The risks and impacts identified are assigned likelihood and consequence ratings with consideration to the Proponent's Guide to Environmental Impact Statements (ACT Government, 2017a).

Table 4.1 Risk Assessment Matrix

		CONSEQUENCE				
		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic/ Significant (5)
LIKELIHOOD	Remote (1)	Negligible (N)	Negligible (N)	Very Low (L)	Low (W)	Medium (M)
	Unlikely (2)	Negligible (N)	Very Low (L)	Low (W)	Medium (M)	High (H)
	Possible (3)	Very Low (L)	Low (W)	Medium (M)	High (H)	Very High (V)
	Likely (4)	Low (W)	Medium (M)	High (H)	Very High (V)	Extreme (E)
	Almost Certain (5)	Medium (M)	High (H)	Very High (V)	Extreme (E)	Extreme (E)

4.1.1 Likelihood

The likelihood of an impact occurring is best described in terms of probability, and in this case, probability assessed through qualitative assessment. In addition, there is a need to recognise there may be uncertainty associated with potential impacts, particularly during the concept design stage. Best practice dictates that, where there is scientific uncertainty, a precautionary approach is warranted which would in turn identify a higher level of risk. **Table 4.2** illustrates the criteria used to determine the likelihood of an impact.

Table 4.2 Likelihood Categories

LIKELIHOOD	
Remote (1)	Extremely rare or previously unknown to occur
Unlikely (2)	Unlikely to occur during the Proposal
Possible (3)	Possible under exceptional circumstances
Likely (4)	May occur during the Proposal or beyond the Proposal
Almost Certain (5)	Expected to occur during the Proposal or beyond the Proposal

4.1.2 Consequence

The consequences of an impact require a degree of subjective assessment, as the likely consequences of an impact may consist of multiple elements. Several of these elements may be interrelated, and as such a consequence is considered to be major if any one of the elements has a predicted major impact.
The varying elements of potential consequences are demonstrated in **Table 4.3**.

The consequence of an impact used within the risk assessment needs to be a reasonably foreseeable consequence. If there is a large amount of uncertainty, then the precautionary approach is adopted, and the consequence is considered to be worse.

Table 4.3 Elements of Consequences

CONSEQUENCE					
	Insignificant (1)	**Minor (2)**	**Moderate (3)**	**Major (4)**	**Catastrophic/Significant (5)**
Community Consequence Descriptions	Negligible complaints or concerns	Public concern limited to local complaints	Local public or media attention and complaints	Attention from media or heightened concern from community	Adverse national media or public attention
	People largely unaffected	Temporary and localised effects on people's livelihoods	Widespread and temporary, or localised and permanent effects on people's livelihoods	Widespread and temporary, or localised and permanent effects on livelihood and/or displacement of people	Entire villages, communities or groups are displaced, and livelihoods are affected
Environmental Consequence Descriptions	Impacts such as localised or short-term effects on habitat, species, or environmental attributes	Onsite release with minor environmental impacts	Onsite release and some detrimental effects	Resulting in off-site release and some detrimental effects	Resulting in permanent offsite detrimental effect
	Negligible environmental impacts	Localised, long term degradation of sensitive habitat, species, or environmental attributes	Localised and irreversible habitat damage or loss of habitat, species, or environmental attributes	Widespread and persistent changes to habitat, individual species, or environmental attributes	Loss of a significant portion of a valued species or loss of effective ecosystem function on a widespread scale
Health/Safety Consequence Descriptions	No detectable change	Some minor detectable change	Change requiring basic treatment or medical attention	Change resulting in medical treatment and hospitalisation	Significant/life threatening change
	No Injuries	First Aid treatment	Medical treatment, lost time injuries, plant damage	Extensive injuries, plant damage	Multiple deaths, or permanent significant injury
Economic	Minimal losses	Several thousand dollars lost revenue or remediation costs	Half million dollars in lost revenue or remediation costs	One million dollars in lost revenue or remediation costs	Several million dollars in lost revenue or remediation costs

4.2 Risk Assessment

The following tables canvas the likelihood and consequences of the key risks associated with the proposed redevelopment of the CBP. The risks are presented in the following table, demonstrating proposed mitigation and management measures, and the subsequent residual risk rating. The impact assessment sections that follow focus on specific matters identified in this risk assessment, discussion of mitigation and management measures, and whether there is a need to further mitigate any potential residual risk.

	CONSEQUENCE				
	Insignificant (1)	**Minor (2)**	**Moderate (3)**	**Major (4)**	**Catastrophic / Significant (5)**
Community Consequence Descriptions	Negligible complaints or concerns	Public concern limited to local complaints	Local public or media attention and complaints	Attention from media or heightened concern from community	Adverse national media or public attention
	People largely unaffected	Temporary and localised effects on peoples livelihoods	Widespread and temporary, or, localised and permanent effects on peoples livelihoods	Widespread and temporary, or, localised and permanent effects on livelihood and/or displacement of people	Entire villages, communities or groups are displaced and livelihoods are affected
Environmental Consequence Descriptions	Impacts such as localised or short term effects on habitat, species or environmental attributes.	Onsite release with minor environmental impacts.	Onsite release and some detrimental effects.	Resulting in off-site release and some detrimental effects.	Resulting in permanent offsite detrimental effect.
	Negligible environmental impacts	Localised, long term degradation of sensitive habitat, species or environmental attributes.	Localised and irreversible habitat damage or loss of habitat, species or environmental attributes.	Widespread and persistent changes to habitat, individual species or environmental attributes.	Loss of a significant portion of a valued species or loss of effective ecosystem function on a widespread scale.
Health /Safety Consequence Descriptions	No detectable change	Some minor detectable change	Change requiring basic treatment or medical attention	Change resulting in medical treatment and hospitalisation	Significant / life threatening change
	No Injuries	First Aid treatment	Medical treatment, lost time injuries, plant damage	Extensive injuries, plant damage	Multiple deaths or deaths, permanent significant injury
Economic	Minimal losses	Several thousand dollars lost revenue or remediation costs	Half million dollars in lost revenue or remediation costs	One million dollars in lost revenue or remediation costs	Several million dollars in lost revenue or remediation costs

Risk matrix and criteria for Likelihood and Consequence is derived from: ACTPLA (undated) *Preparation of an application for scoping; Preparation of an application for an Environmental Significance Opinion, A guide*

Online:
http://www.actpla.act.gov.au/__data/assets/pdf_file/0017/21617/Application_for_scoping.pdf

LIKELIHOOD	
Remote (1)	Extremely rare or previously unknown to occur
Unlikely (2)	Unlikely to occur during the Project
Possible (3)	Possible under exceptional circumstances
Likely (4)	May occur during the Project or beyond the Project
Almost Certain (5)	Expected to occur during the Project or beyond the Project

		CONSEQUENCE				
		Insignificant (1)	**Minor (2)**	**Moderate (3)**	**Major (4)**	**Catastrophic / Significant (5)**
LIKELIHOOD	**Remote (1)**	Negligible (N)	Negligible (N)	Very Low (L)	Low (W)	Medium (M)
	Unlikely (2)	Negligible (N)	Very Low (L)	Low (W)	Medium (M)	High (H)
	Possible (3)	Very Low (L)	Low (W)	Medium (M)	High (H)	Very High (V)
	Likely (4)	Low (W)	Medium (M)	High (H)	Very High (V)	Extreme (E)
	Almost Certain (5)	Medium (M)	High (H)	Very High (V)	Extreme (E)	Extreme (E)

Canberra Brickworks Risk Assessment - Design

'ERROR' below means the risk assessment has increased residual consequence or likelihood

ERRORS 0

Phase of Development	Activity	Number	Affected Theme	Effects Without the application of mitigation or management measures	Likelihood	Consequence	Risk Rating	Is the Risk ALARP?	Mitigation/Management Measures	Residual Risk Likelihood	Consequence	Risk Rating	Is the Residual Risk ALARP?	LIK	CON	CHANGE
Design	Design Development	A1	Approvals	Development footprint exceeds approved Area, resulting in potential non-compliance with PD Act or EPBC Act Approval.	2-unlikely	4-major	M	No	Ensure detailed design is consistent with all relevant planning legislation, policies and any approvals issued for the Proposal, particularly those under the PD Act and EPBC Act. Design works so they occur wholly within approved areas, including mitigation measures for indirect impacts and offsite works.	1-remote	4-major	W	Yes	OK	OK	Lik
		A2	Approvals	Final construction design is not consistent with the approved design, resulting in non-compliance with PD Act or EPBC Act Approval.	2-unlikely	4-major	M	No	Ensure detailed design is consistent with all relevant planning legislation, policies and any approvals issued for the Proposal, particularly those under the PD Act and EPBC Act. Seek appropriate approvals or any proposed actions that are inconsistent with the approved design.	1-remote	4-major	W	Yes	OK	OK	Lik
		PL1	Planning and Land Status	Inconsistency with Yarralumla Neighbourhood Plan and Canberra Brickworks Conservation Management Plan	2-unlikely	3-moderate	W	No	Design the Proposal with consideration for the Canberra Brickworks Conservation Management Plan and the updated Canberra Brickworks Conservation Management Plan (GML, 2021a). Design the Proposal with extensive consultation with the surrounding Yarralumla community and with consideration for the Yarralumla Neighbourhood Plan.	1-remote	3-moderate	L	Yes	OK	OK	Lik
		S1	Social	Design does not reflect the character of the surrounding suburb, resulting in community concern.	2-unlikely	4-major	M	No	Design the Proposal in accordance with Garden City principles and the approved CMP (GML, 2021a). Establish a community panel for ongoing engagement and input into the design of the Proposal (completed). Ensure community panel is engaged throughout the design and assessment process.	1-remote	4-major	W	Yes	OK	OK	Lik
		S2	Social	Inadequate attention to design and layout results in a lack of passive surveillance.	2-unlikely	3-moderate	W	No	Design the Proposal according to CPTED principles and the Estate Development Code. Incorporate design features that minimise impacts to surrounding residential properties (see Section 11.5.2). Design the Proposal in accordance with the Yarralumla Plan, Garden City Values and Principles, and the approved CMP (GML, 2021a).	1-remote	3-moderate	L	Yes	OK	OK	Lik
		B1	Biodiversity	Presence or extent of threatened species or ecological communities or other protected matters (e.g. native vegetation) is not identified prior to development design, resulting in unanticipated impacts.	2-unlikely	4-major	M	No	Base the impact assessment on site specific, recent environmental studies (completed). Use a precautionary approach and risk-based approach to impact assessment for the Proposal (completed).	1-remote	4-major	W	Yes	OK	OK	Lik
		H1	Heritage	The Proposal results in impacts to the heritage values of the Yarralumla Brickworks and Railway Remnants due to the recommendations of the CMP not being appropriately implemented during the design phase.	3-possible	4-major	H	No	Demonstrate compliance with the site's endorsed CMP (GML, 2021a). The Proponent commits to implementing the Conservation Policy in accordance with the Implementation Schedule outlined in Section 6.4 of the CMP. Retain all core and supporting elements and spaces. Implement conservation works to be carried out with regard for the principles of the Australia ICOMOS Burra Charter 1999. Heritage advice would continue to be sought throughout the development process to ensure the heritage values are conserved and interpreted. An archival recording would be undertaken prior to the commencement of any works on site, which would provide an accurate representation of the heritage elements in their current state and would assist with future interpretation opportunities. The proposed works would be undertaken in accordance with an approved AA and AER. The Proponent would work with the ACT Heritage Council to determine the most appropriate way to interpret and potentially adaptively reuse the materials found at BRW8.	2-unlikely	4-major	M	Yes	OK	OK	Lik
		W1	Water Quality and Hydrology	Proposed mitigation measures (e.g. Water Sensitive Urban Design (WSUD)) are not designed to adequately mitigate indirect impacts into nearby Lake Burley Griffin or urban storm water systems, resulting in unanticipated impacts to MNES, aquatic flora and fauna and local residences through increased water flows and decreased water quality.	3-possible	3-moderate	M	No	Implement the water quality treatment strategy proposed by Alluvium (2022). Conduct a Safety in Design assessment for all designs to identify risks associated with the construction, operation and maintenance of an asset. Design would meet the requirements of the WSUD General Code to ensure post-development flows do not exceed pre-development flows. Undertake detailed hydrological modelling during the DA stage of the Proposal in order to assess peak flows, peak storage levels and critical durations for sizing detention storage. Seek endorsement of the proposed stormwater reuse scheme from TCCS. Install a litter trap at the pumping location to increase the Gross Pollutant reduction rate.	2-unlikely	3-moderate	W	Yes	OK	OK	Lik
		W2	Water Quality and Hydrology	Mobilisation of existing groundwater contamination through ineffective design or management of hydrology and water management infrastructure.	2-unlikely	4-major	M	No	Undertake remediation work in accordance with the SAQP, RWP and SMP, in accordance with the requirements of the EPA. Monitor groundwater quality throughout construction and operation of the Proposal by implementing the SAQP, with monitoring to be undertaken at regular intervals (e.g. biannually).	1-remote	4-major	W	Yes	OK	OK	Lik
		B2	Biodiversity	Development requires the removal of more trees than was approved, resulting in non-compliance with PD Act or EPBC Act approvals, potential loss of visual amenity and delays in receiving additional approval.	3-possible	3-moderate	M	No	Survey all trees on site prior to finalisation of design (completed). Seek approval under the PD Act and EPBC Act (as required) for the removal of any trees identified within the design process. Clearly identify trees that have received approval for removal within final designs. Where additional trees are identified as requiring removal during construction, seek approval under PD Act.	2-unlikely	3-moderate	W	Yes	OK	OK	Lik

Canberra Brickworks Risk Assessment - Design

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		R1	Hazard and Risk	Proposed bushfire mitigation measures (e.g., inner asset protection zones) are not adequately managed, both within the CBP and on adjacent land over the life of the Proposal, increasing the bushfire risk to residents.	**2-unlikely**	**5-catastrophic**	**H**	**No**	Apply regulated asset protection zones to the CBP and incorporate during design phase. Collaborate with the adjacent land users (i.e. ACT Government or the Royal Canberra Golf Club) to develop an agreement for the management of IAPZ that fall outside the CBP over the life of the Proposal. Parks within the Proposal are to be maintained to the prescriptions of an IAPZ as defined by the ACT Strategic Bushfire Management Plan (2014). Management is also to comply with the 'Low Threat Vegetation' as defined by Section 2.2.3.2 of AS 3959-2009. Prepare a bushfire management plan to manage asset protection zones.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	Lik
		B3	Biodiversity	Inappropriate landscape plants are chosen, with regard to ecological and social impacts to surrounding areas.	**3-possible**	**3-moderate**	**M**	**No**	Ensure landscape species are suitable for urban use and are compatible with surrounding species within Yarralumla.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		CC1	Climate change and Air Quality	A failure to properly position residential dwellings in the precinct may result in an over-reliance on heating and cooling.	**3-possible**	**3-moderate**	**M**	**No**	Design the Proposal using sustainable environmental design principles, including design responses included in Sections 12.5.3 and 12.5.4.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		H2	Heritage	Material selection and finishes result in additional impacts to the heritage values of the Yarralumla Brickworks as they are not consistent with the CMP.	**3-possible**	**4-major**	**H**	**No**	Incorporate the recommendations and management guidelines of the CMP into the design of the CBP buildings. Development of an Interpretation Strategy (GML, 2022a) that would outline a range of on-site heritage interpretation methods to be developed in consultation with ACT Heritage Council, a heritage advisor and in close reference to the CMP and associated documentation. These would include elements such as signage along with integrated landscape elements and allowing the heritage buildings to speak for themselves through retained and exposed fabric and features.	**2-unlikely**	**4-major**	**M**	**Yes**	OK	OK	Lik
		V1	Landscape and Visual	Material selection and finishes are not consistent with character of the area or land use zoning resulting in visual impacts.	**3-possible**	**3-moderate**	**M**	**No**	Material selection to be made in accordance with the approved CMP (GML, 2021a). Materials would be chosen to minimise reflection or any significant visual impacts. The design of the Proposal would be sympathetic to the Brickworks Heritage Precinct.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		V2	Landscape and Visual	Insufficient landscaping is included in the final design of the Proposal, resulting in reduced amenity for residents and the public.	**2-unlikely**	**3-moderate**	**W**	**No**	Design and implement a considered landscape master plan that seeks to enhance amenity of the Proposal Area. Implement Garden City principles throughout the design process. Retain Tree 276 to protect local community amenity and history.	**2-unlikely**	**2-minor**	**L**	**Yes**	OK	OK	Con
		V3	Landscape and Visual	The design of the Proposal results in significant changes to the existing terrain of the site.	**2-unlikely**	**3-moderate**	**W**	**No**	Design the Proposal to maintain the existing terrain as much as possible.	**2-unlikely**	**2-minor**	**L**	**Yes**	OK	OK	Con
		N1	Noise, Vibration and Lighting	Inadequate attention to design and layout results in noise and lighting impacts on neighbouring residents.	**2-unlikely**	**3-moderate**	**W**	**No**	Provide urban parkland between commercial areas and nearby residential areas to buffer potential noise impacts. Ensure adequate landscaping along property boundaries is included within the design to act as a natural barrier.	**1-remote**	**3-moderate**	**L**	**Yes**	OK	OK	Lik
		T1	Traffic and Transport	Design does not allow for adequate access and carparking, resulting in pressure on surrounding existing road network and potential increase in vehicle collisions	**2-unlikely**	**4-major**	**M**	**No**	Design Brickworks Way to allow for greater access to the Proposal Area, with minor access roads also available from Bentham Street and Denman Street (completed). Include 321 public car parks and 881 private car parks, exceeding the anticipated peak parking demand.	**1-remote**	**4-major**	**W**	**Yes**	OK	OK	Lik
		S3	Social	Design does not include adequate accessibility to urban parklands, resulting in reduced amenity of the area and Proposal.	**2-unlikely**	**2-minor**	**L**	**Yes**	Incorporate parkland into the design of the Proposal (completed).	**2-unlikely**	**2-minor**	**L**	**Yes**	OK	OK	NIL
		T2	Traffic and Transport	Site does not have adequate access for transport, including active transport options.	**2-unlikely**	**4-major**	**M**	**No**	Provide opportunities for active travel through design (completed). Adequate parking and other transport options to be incorporated into the design of the Proposal (completed). Maintain consultation with the ACT Government to ensure that proposed parking arrangements are suitable according to their policies and land use zoning (ongoing).	**1-remote**	**4-major**	**W**	**Yes**	OK	OK	Lik
		T3	Traffic and Transport	The CBP design does not match the designs for the access road being prepared by the ACT Government, resulting in the roads not aligning.	**2-unlikely**	**4-major**	**M**	**No**	Continue consultation with SLA at each stage of detailed design to ensure compatibility (ongoing).	**1-remote**	**4-major**	**W**	**Yes**	OK	OK	Lik
	Site Investigations	**T4**	Traffic and Transport	Uncontrolled access of vehicles and personnel during site investigations results in degradation of adjacent (unapproved) areas through soil compaction, weed introduction, vegetation removal etc. resulting in non-compliance with PD Act approval	**3-possible**	**3-moderate**	**M**	**No**	Establish no-go zones for site investigation studies. Inform all contractors of constraints associated with the site and the approval conditions that must be complied with. Ensure contractors implement an environmental management plan for intrusive works on site.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik

Canberra Brickworks Risk Assessment - Design

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		B4	Biodiversity	Intrusive site investigations (e.g. geotechnical, contamination test pitting) are undertaken prior to PD Act and EPBC Act Approval resulting in impacts to MNES and potential non-compliance with either Act.	**3-possible**	**3-moderate**	**M**	**No**	Liaise with EPSDD and DAWE prior to intrusive site investigations if they are to occur prior to an approval decision being made. Ensure EMP for site investigations identifies go / no-go zones and environmental controls.	**2-unlikely**	**3-moderate**	**W**	**Yes**			
		G1	Soils and Geology	Subsurface conditions that may impact construction activities not identified and inappropriate design concepts developed as a result.	**3-possible**	**4-major**	**H**	**No**	Ensure detailed geotechnical investigations of the Proposal Area are undertaken to inform design (completed). Soil compaction would be used to ensure soil stability for the Proposed development, particularly along the quarry cliffs. Site drawings and detail must be provided to Environment Protection Authority, for approval prior to works commencing.	**2-unlikely**	**4-major**	**M**	**Yes**	OK	OK	Lik
		CC2	Climate change and Air Quality	Increase in greenhouse gas emissions from materials, transportation and construction.	**3-possible**	**3-moderate**	**M**	**No**	Use of sustainable natural materials in construction which have low embodied energy and low life cycle impact, such as timber, recycled steel, aluminium and glass. The use of brick as a dominant material in building the new terraces, apartments and houses which will increase the thermal value (i.e., absorbing heat during the day and releasing at night), contributing towards energy efficiency. Introducing a rooftop photovoltaic system to the core heritage buildings, to provide the precinct's energy usage and aim for a central heritage precinct that is 'net electricity neutral'. Facilitating easy and direct access to public transport and light rail for residents through integrated footpaths and road network. Provide EV charging stations and/or conduits throughout the carpark to enable residents to fit EV charging stations in bays to enable EV choice.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Con
		C1	Contamination	Additional remediation requirements are required beyond those already identified, resulting in delays to the Proposal through the need for further investigation.	**3-possible**	**2-minor**	**W**	**No**	Undertake detailed contamination assessments of the Proposal Area (completed). Prepare appropriate management plans, including SAQP, RWP and SMP (completed). Review and revise as instructed by the EPA Site Auditor. Consult and seek endorsement from the EPA Site Auditor.	**2-unlikely**	**2-minor**	**L**	**Yes**	OK	OK	Lik
	Engineering Inspections; Service Location and Siting	**U1**	Utilities	Existing services do not have the capacity to service the site.	**3-possible**	**3-moderate**	**M**	**No**	Consult with utility entities and ACT Government early in design phase. Consider utility installation constraints during detailed design phase to ensure the new infrastructure integrates with existing system.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		U2	Utilities	Requirement to install new infrastructure to service development impacts existing infrastructure and existing users.	**3-possible**	**3-moderate**	**M**	**No**	Consult with utility entities and ACT Government early in design phase. Consider utility installation constraints during detailed design phase to ensure the new infrastructure integrates with existing system.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
Approvals	**Approvals**	**A3**	Approvals	Potential environmental impacts are considered unacceptable and approval is not granted.	**2-unlikely**	**4-major**	**M**	**No**	Undertake environmental impact assessment of the proposed development and incorporate appropriate management measures as part of the proposal.	**1-remote**	**4-major**	**W**	**Yes**	OK	OK	Lik
	Offset	**B5**	Biodiversity	Issues with proposed offset site availability and suitability (e.g. lease arrangements, land zoning etc.) result in delays to the approvals process impacting on the proposal timeframe.	**3-possible**	**3-moderate**	**M**	**No**	Commence consultation with the ACT Government as soon as possible to identify potential offset options (completed). Engage with DAWE to confirm the appropriate offset approach (completed). Purchase credits under BOS to offset the proposed impact (completed).	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik

Canberra Brickworks Risk Assessment - Construction

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Construction	**Site Establishment**	**N2**	Noise, Vibration and Lighting	Inappropriate selection of machinery and plant resulting in unexpected environmental impacts (noise, dust emissions, vibration).	**3-possible**	**3-moderate**	**M**	**No**	Develop and implement industry best practice CEMP. Implement measures contained within AS 2436. Use modern, well service machinery with appropriate mufflers. Maintain plant and equipment in accordance with manufacturers recommendations and best practice throughout construction.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Con
	Vegetation and Habitat Clearing	**B6**	Biodiversity	Non-compliance with PD Act and EPBC Act approval.	**3-possible**	**3-moderate**	**M**	**No**	Prepare a Flora and Fauna Management Plan as part of the CEMP prior to construction commencing. Conduct pre-clearing surveys to determine clearing boundaries and visibly identify which trees are to be retained (if any). Establish no-go zones, site boundaries, and fences prior to construction commencing. Inform EPSDD immediately if any impacts outside approved area occur.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		B7	Biodiversity	Removal of mature, hollow-bearing trees impacts upon the habitat and dispersal of arboreal species.	**2-unlikely**	**3-moderate**	**W**	**No**	Conduct pre-clearing surveys to determine clearing boundaries and visibly identify which trees are to be retained (if any). Confirm the presence of any mature, hollow-bearing trees. Where they are identified, a suitably qualified fauna-handler/ecologist is to remove any hollow-bearing fauna prior to clearing.	**2-unlikely**	**2-minor**	**L**	**Yes**	OK	OK	Con
		V4	Landscape and Visual	Vegetation clearing results in a loss of visual amenity for local residents.	**3-possible**	**3-moderate**	**M**	**No**	Implement a considered landscape master plan that seeks to enhance amenity of the Proposal Area.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
	Site Access and Management	**T5**	Traffic and Transport	Uncontrolled access by vehicles leads to damage to heritage elements or trees to be retained.	**2-unlikely**	**3-moderate**	**W**	**No**	Establish no-go zones, site boundaries, and fences prior to construction commencing by implementing an industry best practice CEMP to prevent unauthorised access into adjacent areas. Inform EPSDD and DAWE immediately if any impacts outside approved area occur.	**1-remote**	**3-moderate**	**L**	**Yes**	OK	OK	Lik
		T6	Traffic and Transport	Intensification of access road use during construction and the impact of heavy rigid vehicular movements on road surfaces.	**3-possible**	**2-minor**	**W**	**No**	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan. The plan is to include heavy vehicle access timing during construction and procedures for identifying and responding to impacts to road surfaces. Ensure construction teams move trucks carrying excavated material from the Proposal Area to the arterial road network as quickly and efficiently as possible.	**2-unlikely**	**2-minor**	**L**	**Yes**	OK	OK	Lik
		T7	Traffic and Transport	Inability to access the site if the Dudley Street access road is not constructed.	**1-remote**	**2-minor**	**N**	**Yes**	Include construction of Brickworks Way in Stage 1 of construction schedule.	**1-remote**	**2-minor**	**N**	**Yes**	OK	OK	NIL
		T8	Traffic and Transport	Increases in traffic flow on surrounding access roads resulting in the potential for increased motor vehicle collisions and/or pedestrian injuries.	**2-unlikely**	**5-catastrophic**	**H**	**No**	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan. The plan is to include an emergency response procedure to be followed in the event of an accident. Traffic Management Plan is to limit vehicle movement to and from the site where possible. Limit truck movements during peak periods and outside of daytime hours. Ensure truck movements are staged to limit the number of heavy vehicles on the surrounding road network at any one time.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	Lik
		H3	Heritage	Damage to sensitive environmental and heritage items caused by construction vehicles.	**3-possible**	**4-major**	**H**	**No**	Develop and implement industry best practice CEMP including a heritage management plan, which clearly identifies and demarcates environmental and heritage sensitive items/places. Ensure all personnel have training/toolbox talk prior to commencing work to inform them of potential impacts to environmental and heritage sensitive items/places on site. In particular, all site contractors involved in the earthworks stage of the redevelopment should participate in a heritage induction. This induction should include information on the history, heritage values, and significance of the Precinct, the areas of archaeological potential, and the Unexpected Finds Protocol. This induction should be prepared and delivered by a heritage specialist. Ensure all personnel are aware of and acknowledge the locations of environmental and heritage sensitive items/places on site prior to work commencing. Where works on heritage items are not proposed, high visibility protective fencing would be installed around heritage structures within proximity to any nearby construction works under the guidance of an appropriately qualified heritage consultant. Vibration monitoring would be undertaken for heritage elements in close proximity to specific works which are not to be removed as part of the Proposal (refer to Section 13.0). Maintain safe working distances between retained elements and machinery. Where accidental, unapproved damage to heritage items takes place, work would be stopped, and ACT Heritage Council consulted to determine the best course of action for restoring the heritage item.	**2-unlikely**	**4-major**	**M**	**Yes**	OK	OK	Lik

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		T9	Traffic and Transport	Traffic disruptions to local roads as a result of increased volumes during construction.	4-likely	3-moderate	H	No	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan. Traffic Management Plan is also to limit vehicle movement to and from the site where possible. Engage with nearby residents regarding any planned traffic disruptions. Notify surrounding properties of machinery road access timing throughout construction.	3-possible	3-moderate	M	Yes	OK	OK	Lik
	General Construction Activities	C2	Contamination	Discovery of previously unidentified contaminated soil during construction results in additional remediation action and potential risks to on-site personnel.	2-unlikely	4-major	M	No	Undertake remediation of identified contaminated sites in accordance with the SAQP, RWP and SMP prior to general construction commencing. Develop and implement the UFP contained within the SMP for all earthworks and construction activities on site.	2-unlikely	3-moderate	W	Yes	OK	OK	Con
		H4	Heritage	Earthworks result in the destruction of previously unidentified Aboriginal or European cultural heritage items.	2-unlikely	4-major	M	No	Develop and implement an Unanticipated Finds Protocol during clearing and construction activities, including training personnel in unanticipated discovery procedures. In accordance with Policy 10.2 of the CMP, repair work would be undertaken to the subsurface flues (particularly the Downdraught Kilns flues) to ensure that they are made safe prior to any actions associated with the redevelopment works commencing. These works would be developed in consultation with an appropriate engineer and assessed for their impact to the heritage significance of the flues through a SHE. Implement specific measures for BRW12, BRW3 and BRW7 as outlined in Section 17.5.2.1 of this EIS. Archaeological monitoring of BRW2, 4, 5, 6, 8 and 9 in accordance with the AER (GML, 2022a).	1-remote	4-major	W	Yes	OK	OK	Lik
		H5	Heritage	Places listed on the ACT Heritage Register are damaged during construction beyond approved levels.	3-possible	3-moderate	M	No	Develop and implement industry best practice CEMP including a heritage management plan which clearly identifies and demarcates environmental and heritage sensitive items/places. Ensure all personnel have training/toolbox talk prior to commencing work to inform them of potential impacts to environmental and heritage sensitive items/places on site. Ensure all personnel are aware of and acknowledge the locations of environmental and heritage sensitive items/places on site prior to work commencing. Where works on heritage items are not proposed, high visibility protective fencing would be installed around heritage structures within proximity to any nearby construction works under the guidance of an appropriately qualified heritage consultant. Vibration monitoring would be undertaken for heritage elements in close proximity to specific works which are not to be removed as part of the Proposal (refer to Section 13.0). Maintain safe working distances between retained elements and machinery. Where accidental, unapproved damage to heritage items takes place, work would be stopped, and ACT Heritage Council consulted to determine the best course of action for restoring the heritage item. The area around site C would also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).	2-unlikely	3-moderate	W	Yes	OK	OK	Lik
		N3	Noise, Vibration and Lighting	Construction noise and vibration resulting in reduced local amenity and impacts to heritage structures.	3-possible	4-major	H	No	Develop and implement industry best practice CEMP which includes a noise and vibration management plan. Identify sensitive receptors prior to construction commencing. Undertake construction activities during standard construction hours throughout the construction phase. Where out-of-hours construction work is to be undertake, ensure surrounding residents are provided with at least 48 hours' notice prior to commencing out-of-hours work. Maintain plant and equipment in accordance with manufacturers recommendations and best practice throughout construction. Site lighting during construction would be inward facing to prevent anti-social behaviour only.	2-unlikely	4-major	M	Yes	OK	OK	Lik
		W3	Water Quality and Hydrology	Construction activities change water regimes including flow rate, quality, sedimentation, and erosion, resulting in environmental impacts beyond the approved development area.	3-possible	3-moderate	M	No	Develop and implement industry best practice CEMP that includes and implements management plans to avoid or minimise environmental risks. Prepare a detailed surface water management strategy prior to construction.	2-unlikely	3-moderate	W	Yes	OK	OK	Lik
		W4	Water Quality and Hydrology	Bioremediation failure results in leaching of contaminants into groundwater.	2-unlikely	4-major	M	No	A Safety in Design assessment is conducted for all designs to identify risks associated with the construction, operation, and maintenance of an asset. This includes risks to works, community and those that would be maintaining the system, as well as risks to the environment. All design teams and projects should endeavour to consult with those who would ultimately be maintaining the system, in order to identify required changes to designs so that the assets continue to function appropriately.	1-remote	4-major	W	Yes	OK	OK	Lik
		M1	Materials and Waste	Increased waste to landfill during construction.	4-likely	2-minor	M	No	Develop and implement industry best practice CEMP prior to construction, which includes a waste management plan. The waste management plan is to consider alternative options to landfill, including recycling and reuse of materials.	4-likely	1-insignificant	W	Yes	OK	OK	Con

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		M2	Materials and Waste	Construction wastes are not sorted appropriately resulting in target percentages for reuse/recycling not being reached and excess quantities being disposed to landfill.	**3-possible**	**3-moderate**	**M**	**No**	Conduct construction activities in accordance with EP Act requirements and engage independent auditors to confirm compliance. Implement training for all personnel in waste sorting and designate responsibilities prior to construction commencing.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		S4	Social	Construction activities cause a loss of residential amenity through dust, noise and lighting impacts.	**3-possible**	**3-moderate**	**M**	**No**	The CEMP is to include measures to control dust, noise and lighting to minimise impacts on nearby residents. Refer to mitigation measures for noise, vibration, lighting, landscape and visual. Operate under the existing Environmental Protection Agreement with the EPA.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		R2	Hazard and Risk	Loss of life and property resulting from construction fire.	**2-unlikely**	**5-catastrophic**	**H**	**No**	Develop and implement industry best practice CEMP prior to construction works commencing. Implement an approved bushfire hazard management plan during construction. Maintain plant and equipment in accordance with manufacturers' recommendations and best practice. Observe seasonal and daily fire hazard warnings issued by the ACT ESA. Cease all works that could emit a spark (hot works including cutting, welding, grinding, rock excavation etc) under a declared Total Fire Ban Keep vehicles on formed roads and paths, away from long grass where possible. Provide appropriate parking areas for personnel that are away from long grass and other ignition sources. Apply smoking restrictions throughout the construction site, providing designated smoking areas. Avoid unnecessary idling of vehicles.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	Lik
		R3	Hazard and Risk	Loss of life and property resulting from inadequate response to construction fire.	**2-unlikely**	**5-catastrophic**	**H**	**No**	Include a fire response plan within the CEMP. Ensure all personnel on site are advised of fire response protocols and emergency exit procedures during site inductions. Ensure fire extinguishers are available in all construction site compound buildings.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	Lik
		C3	Contamination	Fuel or chemical spills or inappropriate material storage contaminates soil, groundwater and/or local waterways, which could result in environmental degradation and fines under EP Act.	**3-possible**	**4-major**	**H**	**No**	Develop and implement industry best practice CEMP that includes the following measures: '- Identify location of site sheds/storage areas and construction vehicle parking in CEMP away from sensitive areas - Develop a spill management protocol to be incorporated into the CEMP prior to construction. - Ensure toxic substance are appropriately stored with restricted access.	**2-unlikely**	**4-major**	**M**	**Yes**	OK	OK	Lik
		C4	Contamination	Contaminants within stockpiles of soil and waste are dispersed into surrounding areas.	**2-unlikely**	**4-major**	**M**	**No**	Develop and implement industry best practice CEMP that includes the following measures: '- Ensure stockpiles are tested for contaminants, are appropriately bunded and positioned away from nearby drainage lines. - Implement dust suppression measures throughout construction to ensure stockpiles do not spread any contaminated particles, e.g. dampening of stockpiles. - Implement (to be endorsed) RWP and SMP to ensure contaminants are appropriately remediated or encapsulated.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Con
		V5	Landscape and Visual	Visual impacts of construction on the landscape and to the local community.	**4-likely**	**2-minor**	**M**	**No**	Develop and implement industry best practice CEMP which includes stockpile management strategies. Locate laydown areas and stockpiles away from sensitive viewers. Erect fences and other barricades around construction site such that they reduce the visual impacts of the construction phase. Implementation of a traffic management plan to minimise timing and frequency of heavy vehicles on local streets as much as practicable.	**4-likely**	**1-insignificant**	**W**	**Yes**	OK	OK	Con
		B8	Biodiversity	Spread of invasive species off-site, e.g. Chilean needlegrass, African lovegrass.	**4-likely**	**3-moderate**	**H**	**No**	Develop and implement industry best practice CEMP prior to construction, that includes a weed management plan that addresses potential spreading of existing invasive species (particularly Chilean needlegrass) through construction vehicles, personnel, and vegetation waste. Identify areas of weed infestation for removal, management and avoidance during and after construction. Ensure plant, equipment and clothing are free of soil and vegetative matter prior to being brought to site. Where possible, disturbance of native vegetation would be minimised. Monitor high-risk areas such as access roads, stockpiles, and bare ground. Ensure erosion controls are in place to minimise the spread of weeds from run off. Undertake weed removal activities where appropriate, including prior to and after construction. Do not use weed material as mulch on site unless it has been appropriately composted to remove any potential re-growth.	**3-possible**	**3-moderate**	**M**	**Yes**	OK	OK	Lik

Canberra Brickworks Risk Assessment - Construction

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		G2	Soils and Geology	Soil disturbance and imported fill leads to adverse impacts, such as erosion and dispersion (air and waterways).	**4-likely**	**2-minor**	**M**	**No**	Develop and implement industry best practice CEMP prior to construction, that includes an ESCP. Implement dust suppression measures such as dampening exposed soil and ceasing work during windy conditions throughout construction. Ensure soil is appropriately compacted and stabilised prior to and post construction. A sediment control fence and cut off drain to be installed to the east of the Heritage Core to prevent impacts during construction. The fence is to be checked and reinstated (if needed) on a weekly basis. Stockpile/s to be located away from drainage lines and surface flow paths. Contoured striations or furrows to be provided to stockpiles to minimise erosion. Where underground stormwater drainage is installed to internal roadworks, provide inlet filter. Environment Protection Agreement to be taken out by contractor with EPA. All new construction work to be contained within the site except for approved service connections and roadworks. Limit access to site during and immediately after wet weather. Regularly remove any soil from roads adjacent to the site. No storage of construction materials, or parking of vehicles and equipment permitted outside of block without TCCS approval. No site sheds, storage sheds or site amenities to be erected outside of block without TCCS approval. Provide kerbside filter roll to existing sumps. Kerbside filter rolls to be removed, cleaned and reinstated on a weekly basis at a minimum. Trapped sediment about sumps also to be removed. Cleaning also to take place immediately after periods of rainfall during construction. All service trenches to be backfilled within 24 hours of inspection. Excess soil is to be disposed at an EPA approved location. The site foreman is to contact the EPA to arrange a site inspection and endorsement of	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Lik
									Excess soil is to be disposed at an EPA approved location. The site foreman is to contact the EPA to arrange a site inspection and endorsement of sediment and erosion control measures prior to works commencing. The site foreman is to contact the EPA to discuss any proposed major changes to sediment and erosion controls on site prior to implementing the changes. Discharge from the pond is permissible when the water pH is 6.5-8.5 and is clarified to at or below 60 mg/L (50 NTU). If sediment level is greater, then prior to discharge, the dam must be dosed with either alum or gypsum and allowed to settle until the sediment is less that 60 mg/L (50 NTU). Water level in sediment control ponds to be maintained at less than 20% of capacity to allow runoff storage during a rain event. Regular dredging of the dam must be carried out to remove silt. The area around site C will be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. Areas demonstrating anticlinal folding will also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).							
		C5	Contamination	Disturbance to identified AECs expose potentially hazardous materials.	**3-possible**	**4-major**	**H**	**No**	Undertake detailed contamination assessments to identify AECs (completed). Prepare and implement appropriate management plans, including SAQP, RWP and SMP (completed). Review and revise as instructed by the EPA Site Auditor. Consult and seek endorsement from the EPA Site Auditor. Implement appropriate health and safety measures when removing or remediating AECs Any surplus soil needed to be removed from the site generated as part of the RWP must be assessed in accordance with ACT EPA (2019a) Information Sheet 4. No soil is to leave the site without ACT EPA approval. Asbestos removal is to be carried out by an appropriately qualified person with a Worksafe ACT licensed Asbestos Assessor. Implement endorsed RWP and SMP to ensure contaminants are appropriately remediated or encapsulated.	**2-unlikely**	**4-major**	**M**	**Yes**	OK	OK	Lik
		CC3	Climate change and Air Quality	Dust emissions during construction resulting in health problems for both workers and neighbours.	**2-unlikely**	**4-major**	**M**	**No**	Implement an industry best practice CEMP including measures such as: '- Dust suppression, including through dampening and/or covering of stockpiles. - Isolation of excavated areas and transfer points. - Trucks to be covered when travelling off site or hauling over long distances. - Minimisation of exposed soil surfaces and regeneration as soon as practical.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Con
		CC4	Climate change and Air Quality	Increase in GHG emissions as result of using fuel-based plant and equipment.	**3-possible**	**3-moderate**	**M**	**No**	Implement an industry best practice CEMP. Construction and demolition waste would be recovered and recycled where possible, and vegetation waste would be composted. Recycled materials would be reused where possible to reduce GHG emissions associated with embodied energy. Fuel efficiency of the construction plant/equipment would be assessed prior to selection, and where practical, equipment with the highest fuel efficiency and which uses lower GHG intensive fuel (e.g. biodiesel) would be used, where practicable. Regular maintenance of equipment would be undertaken to maintain good operations and fuel efficiency.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		CC5	Climate change and Air Quality	Increase in GHG emissions as result of transportation of materials and staff movement.	**3-possible**	**3-moderate**	**M**	**No**	Where possible, using locally sourced materials to reduce GHG emissions associated with transport. Construction/transport plans would be incorporated within the CEMP to minimise the use of fuel during construction.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik

Canberra Brickworks Risk Assessment - Construction

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		G3	Soils and Geology	Widespread use of fill across the site results in the destabilisation / lack of density / compaction necessary for construction.	**3-possible**	**3-moderate**	**M**	**No**	Undertake additional detailed geotechnical investigations to confirm most appropriate construction methods. Stabilised construction entrance to be constructed prior to access to site by construction vehicles. Aggregate to be turned when sediment builds up and renewed when required. Carry out appropriate stabilisation and compaction work prior to and post construction. Ensure protocols for soil compaction are included in the CEMP to ensure safe work.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		H6	Heritage	Construction and landscaping works impact upon / damage the Yarralumla Formation.	**3-possible**	**3-moderate**	**M**	**No**	Design the Proposal so that the Significant Features of the quarry identified in the Yarralumla Brickworks heritage listing remain intact and can act as a monument displaying the Yarralumla Formation. The area around site C would also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		U3	Utilities	Construction activities result in damage to utilities and other essential infrastructure.	**3-possible**	**3-moderate**	**M**	**No**	Collaborate with utility and service providers to determine the location and risk of damage of services prior to construction commencing. Mark and/or map the location of utilities at risk of damage and provide to contractors prior to construction commencing. Use hazard identification tools in accordance with WHS standards to identify potential risks to workers.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		U4	Utilities	Construction staging of utilities and other essential infrastructure not considered in relation to broader development, resulting in additional impacts to surrounding residents and local community.	**3-possible**	**3-moderate**	**M**	**No**	Collaborate with utility providers and ACT Government to ensure construction staging minimises impacts to surrounding residential area.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
	Compliance	**B9**	Biodiversity	Construction activities result in environmental impacts that are not reported or otherwise acted upon adequately.	**3-possible**	**3-moderate**	**M**	**No**	Require that contractors appoint a third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits are to be reported back to EPSDD and other agencies as appropriate.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		A4	Approvals	CEMP, including monitoring and auditing requirements, is not implemented effectively leading to various environmental, social, and economic impacts.	**3-possible**	**3-moderate**	**M**	**No**	Appoint an independent third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits would be reported back to the EPSDD and other agencies as appropriate.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		A5	Approvals	Risk not adequately identified resulting in incomplete understanding of environmental constraints.	**3-possible**	**3-moderate**	**M**	**No**	Re-evaluate the risk assessment throughout the life of the Proposal (until fully operational) as additional information becomes available to ensure all potential environment impacts are adequately identified and assessed.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik

Canberra Brickworks Risk Assessment - Operation

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Operational	Residential and recreational use	T10	Traffic and Transport	Increased public access to the CBP and new potential conflict points results in impacts to adjacent residents, including traffic congestion, vehicle accidents, and parking issues.	3-possible	4-major	H	No	Promote active travel options to residents to reduce the need for vehicle traffic. Ensure access points, pedestrian paths and roads are maintained and utilised properly to minimise nuisance to surrounding residents. Maintain public parking on site to reduce overflow on-street parking in neighbouring areas.	2-unlikely	4-major	M	Yes	OK	OK	Lik
		H7	Heritage	Use of the Canberra Brickworks results in detrimental effects to the heritage values.	3-possible	4-major	H	No	Develop and implement a detailed operational CMP, including ongoing maintenance of heritage items throughout operation of the site.	2-unlikely	4-major	M	Yes	OK	OK	Lik
		CC6	Climate change and Air Quality	Additional residential and vehicular activities result in increases in GHG emissions.	3-possible	3-moderate	M	No	Orientation of dwellings, where possible, to maximise the sun exposure in winter and minimise exposure in summer. Designing buildings to allow cross ventilation to reduce reliance on mechanical ventilation. Provide EV charging stations and/or conduits throughout the carpark to enable owners to fit EV charging stations. Use of low energy and LED lighting. Facilitating easy and direct access to public transport and light rail for residents through integrated footpaths and road network.	2-unlikely	3-moderate	W	Yes	OK	OK	Lik
		CC7	Climate change and Air Quality	Future (2030 and 2070) increase in extreme air temperatures affecting occupant and visitor comfort and causing death of vegetation in the wetland treatment system.	4-likely	2-minor	M	No	Wetland water levels monitored during heatwaves and adjusted as required to keep plants alive. Replanting program for any plants lost during extreme events. Outdoor parking undercover or underground. Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas.	4-likely	1-insignificant	W	Yes	OK	OK	Con
		CC8	Climate change and Air Quality	Future (2030 and 2070) increase in extreme air temperatures leading to potential loss of trees/plants which aren't designed to withstand conditions, and heat retention from increased concrete and hard, landscaped areas.	4-likely	2-minor	M	No	Replanting program for any plants lost during extreme events. Increase green space and canopy cover of the area. Develop an industry best practice OEMP to ensure trees are regularly maintained to ensure natural shading is provided throughout operation of the Proposal. Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas. Shade structures and vegetated pergolas which can be used to combat high solar radiation intensity on hot summer days will be explored in the design phase.	4-likely	1-insignificant	W	Yes	OK	OK	Con
		CC9	Climate change and Air Quality	Current and future (2030 and 2070) increase in extreme air temperatures causing technology exposure, equipment overheating, and bushfire threat causing damage to infrastructure and restricted emergency services access.	3-possible	3-moderate	M	No	Locate systems appropriately. Providing shelter for equipment will reduce the impact of UV radiation and weather and increased temperature. Locate power and communications infrastructure underground. Maintain asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Reduce fuel loading of green spaces. Use of designated access/street for emergency service vehicles.	3-possible	2-minor	W	Yes	OK	OK	Con
		CC10	Climate change and Air Quality	Future (2030 and 2070) increase in >35^{o}C days causing pedestrian discomfort.	3-possible	2-minor	W	No	Outdoor parking undercover or underground. Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas.	3-possible	1-insignificant	L	Yes	OK	OK	Con
		CC11	Climate change and Air Quality	Future (2070) increase in >35^{o}C days causing exposed buildings to have increased speed in degradation of building materials, facades, and hardscaped areas.	3-possible	3-moderate	M	No	Specification of durable materials to maximise lifespan of building components.	3-possible	2-minor	W	Yes	OK	OK	Con
		CC12	Climate change and Air Quality	Future (2030 and 2070) increase in >35^{o}C days causing heat retention in exposed metal contact (handrails, kids playgrounds etc), and exposed railroad tracks.	4-likely	4-major	V	No	Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas. Use of alternative materials for playground equipment to be investigated to minimise heat retention.	2-unlikely	4-major	M	Yes	OK	OK	Lik
		CC13	Climate change and Air Quality	Current and future (2030 and 2070) bushfires within the proximity of the development may lead to smoke and limited visibility/poor air quality for occupants and visitors.	3-possible	4-major	H	No	100% recycled air in majority of apartments.	3-possible	3-moderate	M	Yes	OK	OK	Con
		CC14	Climate change and Air Quality	Future (2030 and 2070) bushfires may lead to loss of property or life.	3-possible	5-catastrophic	V	No	Maintain asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Reduce fuel loading of green spaces.	3-possible	3-moderate	M	Yes	OK	OK	Con
		CC15	Climate change and Air Quality	Current and future (2030 and 2070) increase in extreme wet weather causing flooding and subsequent damage to infrastructure and services, increase in stormwater runoff, and increased severity of hailstorms causing damage to property and personal injury.	3-possible	4-major	H	No	No further mitigation measures proposed as flooding impact not considered high risk.	3-possible	3-moderate	M	Yes	OK	OK	Con

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		CC16	Climate change and Air Quality	Future (2030 and 2070) increase in extreme wet weather causing excess water ingress leading to loosening of soils and potentially affecting stability of the heritage chimney.	**3-possible**	**4-major**	**H**	**No**	Chimney stacks currently structurally sound but will continue to be monitored as part of ongoing management for structural performance. Structures to be retained will be waterproofed.	**3-possible**	**3-moderate**	**M**	**Yes**	OK	OK	Con
		CC17	Climate change and Air Quality	Current and future (2030 and 2070) increase in extreme wet weather causing potential flooding of lower level carparks.	**3-possible**	**3-moderate**	**M**	**No**	Assess parking access road levels to minimise water ingress and provide strategies to manage excess water flow.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Con
		CC18	Climate change and Air Quality	Future (2070) increase in extreme wet weather resulting in flow paths through the heritage area.	**3-possible**	**3-moderate**	**M**	**No**	Implement management measures outlined in Section 10.0. Design would meet the requirements of the WSUD General Code (EPSDD, 2020) to ensure post-development flows do not exceed pre-development flows.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Con
		CC19	Climate change and Air Quality	Drought causing current and future (2030) reduction in water availability for wetlands and irrigation.	**3-possible**	**3-moderate**	**M**	**No**	Implement management measures outlined in Section 10.0.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Con
		CC20	Climate change and Air Quality	Drought causing future (2070) reduction in water availability for irrigation.	**3-possible**	**3-moderate**	**M**	**No**	Implement management measures outlined in Section 10.0.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Con
		T11	Traffic and Transport	Roads and infrastructure deteriorate due to increased use requiring more frequent maintenance.	**4-likely**	**2-minor**	**M**	**No**	Include relevant internal roads and intersections in the ACT road maintenance and upgrade program. Private internal roads are to be incorporated into the OEMP to ensure they receive ongoing maintenance.	**4-likely**	**1-insignificant**	**W**	**Yes**	OK	OK	Con
		M3	Materials and Waste	Increased waste to landfill during operation.	**4-likely**	**2-minor**	**M**	**No**	Develop and implement an industry best practice OEMP prior to occupation, including ongoing waste management measures. The OEMP is to aim to facilitate alternative waste management practices within the site, such as recycling and reuse.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Lik
		V6	Landscape and Visual	Visual impact of the new precinct on the surrounding landscape.	**2-unlikely**	**3-moderate**	**W**	**No**	Careful design and siting of buildings, having consideration for topography and surrounding views. Develop and implement an industry best practice OEMP prior to occupation, including ongoing landscape management.	**1-remote**	**3-moderate**	**L**	**Yes**	OK	OK	Lik
		N4	Noise, Vibration and Lighting	Increases in residential activity may lead to additional noise and lighting during operation in and adjacent to the precinct.	**3-possible**	**3-moderate**	**M**	**No**	Develop NMPs during the DA phase that meet ACT residential and commercial noise requirements. Design the Proposal with consideration for potential noise and lighting impacts to surrounding properties. No lighting is to be installed at the proposed tennis courts and operational lighting impacts to surrounding residents are to be minimised through considered brightness and placement during detailed design.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		S5	Social	Intensification of the use of the precinct causes a loss of residential amenity	**2-unlikely**	**2-minor**	**L**	**Yes**	Refer to mitigation measures for noise, vibration, lighting, landscape and visual. Implement an industry best practice OEMP, including measures to manage landscape and visual, noise, vibration and lighting impacts in Sections 9.5 and 13.5 respectively. Ensure street connections between Dudley Street, Bentham Street and Denman Street are not publicly accessible to prevent the road network from becoming a thoroughfare.	**2-unlikely**	**2-minor**	**L**	**Yes**	OK	OK	NIL
		S6	Social	Inadequate existing social services within the area to support an increase in population as a result of the Proposal	**3-possible**	**3-moderate**	**M**	**No**	Provide mixed use and commercial spaces that may accommodate social services, such as a medical general practice or childcare facility.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		C6	Contamination	Potential ongoing risks to residents and passive users of the site as a result of exposure to contaminants (particularly lead and asbestos)	**1-remote**	**5-catastrophic**	**M**	**No**	Implement UFP contained within SMP (to be endorsed). Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Develop and implement an industry best practice OEMP including EPA contact information for any chance finds identified during operation.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	NIL
		C7	Contamination	Remediation works fail to adequately remove contaminants from the soil resulting in ongoing health risks to community and the environment.	**1-remote**	**5-catastrophic**	**M**	**No**	Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Undertake regular monitoring of any containment system kept on site containing contaminated material throughout operation, the frequency of which to be determined by the EPA.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	NIL
		C8	Contamination	Potential for currently unknown contaminants to impact upon the health of residents and visitors to the precinct	**1-remote**	**5-catastrophic**	**M**	**No**	Implement UFP contained within SMP (to be endorsed). Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Develop and implement an industry best practice OEMP including EPA contact information for any chance finds identified during operation.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	NIL
		PL2	Planning and Land Status	Sterilisation of surrounding land uses.	**2-unlikely**	**3-moderate**	**W**	**Yes**	No mitigation required. Land uses are consistent with surrounding areas and would be revitalising a long-term brownfield site. No impact to the use of surrounding land uses is expected.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	NIL
	Ongoing maintenance	**R4**	Hazard and Risk	Fire hazard management conducted at an inappropriate interval and intensity leading to increased risk to residents.	**2-unlikely**	**5-catastrophic**	**H**	**No**	Maintain inner asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Develop and implement an industry best practice bushfire management plan as part of the OEMP including details as to the frequency and intensity of fire hazard management throughout operation of the site.	**1-remote**	**5-catastrophic**	**M**	**Yes**	OK	OK	Lik

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		B10	Biodiversity	Re-establishment of weed infestation, leading to increased risk to off-site areas.	**3-possible**	**3-moderate**	**M**	**No**	Develop and implement an industry best practice OEMP, including ongoing weed and pest management and monitoring measures.	**3-possible**	**2-minor**	**W**	**Yes**	OK	OK	Con
		H8	Heritage	Places listed on the ACT Heritage Register are damaged during ongoing residential and recreational use.	**2-unlikely**	**3-moderate**	**W**	**No**	Develop and implement a detailed operational CMP, including ongoing maintenance of heritage items throughout operation of the site. Develop and implement an industry best practice OCMP that incorporates relevant ACT Heritage approvals and advice and provides contact details for ACT Heritage Council in the event any damage occurs to heritage items during operation.	**1-remote**	**3-moderate**	**L**	**Yes**	OK	OK	Lik
		G4	Soils and Geology	Subsurface conditions that may result in long-term impacts to new development, such as erosion and sedimentation, and soil instability.	**2-unlikely**	**4-major**	**M**	**No**	Ensure soil is appropriately compacted and stabilised prior to and post construction.	**1-remote**	**3-moderate**	**L**	**Yes**	OK	OK	Both
		W5	Water Quality and Hydrology	Increased run off from impervious surfaces, such as car parks, increases flow downstream.	**3-possible**	**3-moderate**	**M**	**No**	Implement the water quality treatment strategy proposed by Alluvium (2022). Design would meet the requirements of the WSUD General Code (EPSDD, 2020) to ensure post-development flows do not exceed pre-development flows. Ongoing management of all stormwater management assets would be incorporated into the OEMP. WSUD infrastructure would be maintained to standards set out in the WSUD General Code. Monitor groundwater quality throughout construction and operation of the Proposal by implementing the SAQP, with monitoring to be undertaken at regular intervals (e.g. biannually).	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik
		W6	Water Quality and Hydrology	Inadequate water flows and water treatment result in reduced water quality, impacting aquatic flora and fauna, landscaping, and local residents.	**3-possible**	**3-moderate**	**M**	**No**	Implement the water quality treatment strategy proposed by Alluvium (2022). Undertake detailed hydrological modelling during the DA stage of the Proposal in order to assess peak flows, peak storage levels and critical durations for sizing detention storage. Prepare a detailed surface water management strategy prior to construction.	**2-unlikely**	**3-moderate**	**W**	**Yes**	OK	OK	Lik

5.0 Land Use and Planning

Section Summary
This Section provides an overview and assessment of the potential impacts associated with land use and planning as a result of the Proposal. The Section considers existing planning policy for the site, as well as surrounding land uses.

5.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
A1	Development footprint exceeds approved Area, resulting in potential non-compliance with PD Act or EPBC Act Approval.	2 - unlikely	4-major	M	No
A2	Final construction design is not consistent with the approved design, resulting in non-compliance with PD Act or EPBC Act Approval.	2-unlikely	4-major	M	No
PL1	Inconsistency with Yarralumla Neighbourhood Plan and Canberra Brickworks Conservation Management Plan.	2-unlikely	3-moderate	W	No
A3	Potential environmental impacts are considered unacceptable and approval is not granted.	2-unlikely	4-major	M	No
Construction					
A4	CEMP, including monitoring and auditing requirements, is not implemented effectively leading to various environmental, social, and economic impacts.	3-possible	3-moderate	M	No
A5	Risk not adequately identified resulting in incomplete understanding of environmental constraints.	3-possible	3-moderate	M	No
Operation					
PL2	Sterilisation of surrounding land uses.	2-unlikely	3-moderate	W	Yes

5.2 Existing Conditions and Values

Full details of the legislative and strategic planning context of the Proposal and the site are considered in **Section 3.0** of this EIS. The following provides a summary of key points.

5.2.1 Existing Planning Framework

The CBP is located on Territory Land, with the Territory Plan being the key statutory planning document that applies to the Proposal Area. The Territory Plan identifies that the Proposal Area is zoned CZ6 (Leisure and Accommodation Zone) and with a small part in the north-east corner of Block 1 zoned RZ1 (Suburban Zone) (refer to **Figure 2.1**).

The Proposal Area is governed by the Yarralumla Precinct Map and Code (RC1) (refer to **Section 3.3.4**). The code, in the criteria, identifies additional controls for the CBP such as floor area for shops and offices, and a maximum building height of three storeys for residential and two storeys for other uses. The criteria also set out a minimum setback of 20 m to the northern and eastern boundary. The Proposal is permissible in the CBP and has been designed to reflect zoning and code requirements.

Lands to the west and south of the Proposal Area are Designated National Land under the NCP as part of the National Capital Open Space System associated with Lake Burley Griffin and Foreshores. The NCP is the strategic plan for Canberra and the Territory to ensure that developments are planned in recognition of the unique purpose, setting, character and symbolism of Australia's national capital. The Proposal Area is not Designated National Land and is not expected to impact the NCP or require approval from the NCA.

5.2.2 Existing Environment

The Proposal Area is situated on Blocks 1, 7, and 20, Section 102, with an area of 16.09 ha. As outlined within the Canberra Brickworks and Environs Planning and Development Strategy (LDA, 2015), the CBP is located in an area of Canberra with a rich urban and landscape setting. Yarralumla is a suburb within a landscape setting surrounded by an arc of green space from the south-west to the edge of Lake Burley Griffin in the north. The Westbourne Woods are to the north and west of the Proposal Area, being a remnant landscape preserved within the grounds of CSIRO, the Royal Canberra Golf Club and the Yarralumla Nursery on the lake shore.

The majority of the suburb consists of the following land use zones under the Territory Plan:

- RZ1 Suburban
- RZ2 Suburban Core
- CZ4 Local Centre
- PRZ1 Urban Open Space.

Yarralumla is generally connected through a rational street pattern, with the exception of some newer areas immediately surrounding the CBP; notably the battle axe or internalised blocks off Lane-Poole Place, Woolls Street and Schomburgk Street. Bentham Street provides a pedestrian connection between the existing Yarralumla shops and the edge of the CBP.

Elements of the Burley Griffin Plan are visible within the area surrounding the CBP, particularly through the presence of vibrant local centres, including Yarralumla and Deakin, with close proximity to Civic and Capital Hill. These centres feature legible, connective street networks with walkable urban blocks prefaced on the axial planning suggested by the Burley Griffin Plan.

The site itself is characterised by a combination of landscape and historical elements, though these elements are currently not celebrated or utilised. It is noted that the CBP has a complex boundary of built and open edges, both public and private. Backyards and blank fences define the built edge of residential properties located on the east and north of the CBP. Meanwhile vegetated areas exist to the south, separating the site from Cotter Road.

The CBP has a history of disturbance, predominantly associated with its 60-year history operating as a brickworks that sourced materials from a quarry on-site (refer to **Section 1.2**). There are no permanent watercourses within the Proposal Area, however, surface flows generally discharge into Lake Burley Griffin/Molonglo River to the north and subsequently into the Murrumbidgee River. The former quarry is also known to temporarily fill with rainwater.

5.3 Investigations

This Section focusses on the literature review of legislation and planning policies undertaken in **Section 3.0** of this EIS. In addition, this assessment has provided a qualitative assessment of the Proposal against the Yarralumla Neighbourhood Plan (ACT Planning and Land Authority, 2004) and the Canberra Brickworks Conservation Management Plan (Lovell Chen, 2022, refer to Appendix F36 in **Appendix F**).

The assessment of land use and planning impacts involved:

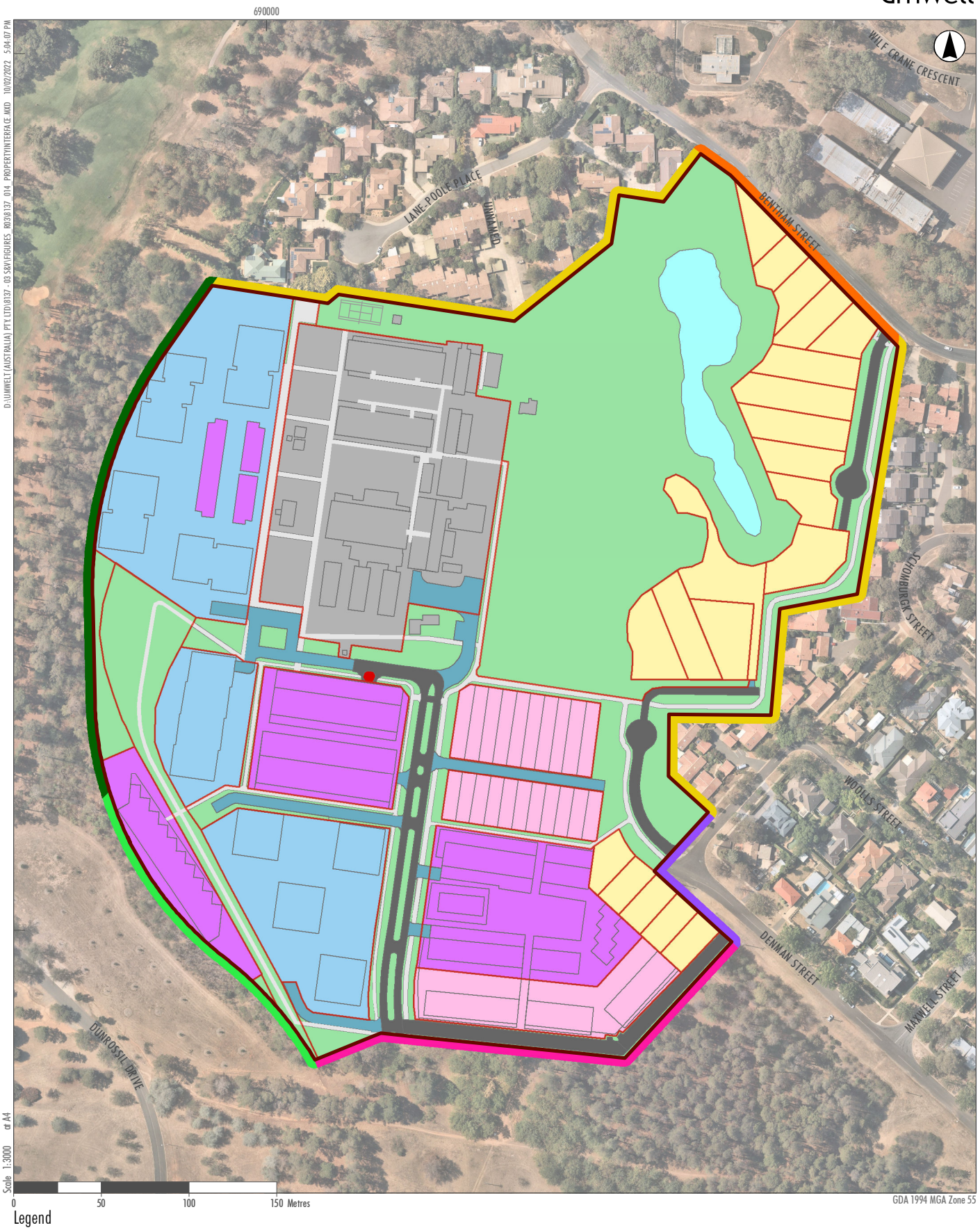
- A review of the legislative framework, strategic policies, planning frameworks, local plans, and zoning as they control land use and development with the Proposal Area.
- An analysis of existing land uses within the Proposal Area and its surrounds.
- Identification and consideration of any future developments near the Proposal Area to understand likely future land use changes.
- An assessment of potential implications for existing and likely future land uses arising from the Proposal's construction and operation.
- Identification of measures to avoid or manage and mitigate potential impacts on land use and enhance opportunities for future land use change.

5.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised with regard to land use and planning in **Section 5.1** above, the potential impacts of the proposed redevelopment of the CBP relating to land use and planning may be characterised as:

- Inconsistency with relevant planning policy and approvals, resulting in a development design that is not suitable for the site and surrounding area.
- Failure to implement appropriate management measures (notably, a CEMP) and identify risks.
- Constraints to surrounding land uses and future development within the area.

These potential impacts are analysed in detail below.



Legend

- Proposal Area
- Apartment Typology
- Heritage Precinct
- Single Dwelling Block with Community Title Scheme
- Single Dwelling Lots
- Terrace Typology
- Open Space
- Water
- Community Title Road / Driveway
- Public Carpark Entry
- Public Roads
- Shared/Footpath
- Structures to be Demolished

Property Interfaces

- Bentham Street
- Denman Street
- Dudley Street
- Dunross Drive
- Royal Canberra Golf Club
- Residential

FIGURE 5.1

Property Interface

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2020)

5.4.1 Consistency with Relevant Planning Policy and Approvals

The Scoping Document identified the potential for the Proposal to be inconsistent with the Yarralumla Neighbourhood Plan (ACT Planning and Land Authority, 2004) and the Canberra Brickworks Conservation Management Plan (Lovell Chen, 2022) (refer to Appendix F36 in **Appendix F**). The impact of non-compliance with relevant planning policies and approvals, from a planning and land use perspective, would be the construction of a development that was not suitable for the site or the surrounding area.

The planning and design of the proposed redevelopment is considered to directly respond to the characteristics of the site and surrounding context. The key considerations that have directed the adopted approach to the planning and design of the development include:

- **Existing character of the surrounding area:** the Proponent has long recognised that maximising development does not necessarily equate to an optimal development outcome. As such, the focus of the Proposal's design has been to harmonise the character of the CBP with Canberra's Garden City principles, which resonate particularly in the suburb of Yarralumla.
- **Heritage:** the proposed redevelopment has been designed to promote and celebrate the heritage elements of the CBP, going beyond the 2010 CMP in proposing an adaptive reuse of additional non-core elements.
- **Neighbouring amenity**: noting the complex boundary of the site, the Proponent has sought to provide a diverse range of land uses and development throughout the CBP that have regard to surrounding properties. This has included extensive landscaping to provide visual screening, noise mitigation and general amenity to surrounding properties.

Through this approach, the Proposal achieves consistency with relevant planning policies, particularly the Yarralumla Neighbourhood Plan and the Canberra Brickworks Conservation Management Plan. The compliance of the Proposal with the key strategies of the Yarralumla Neighbourhood Plan is assessed in **Table 5.1** below. The compliance of the Proposal with the key strategies of the Canberra Brickworks Conservation Management Plan is discussed in **Section 17.0** of this EIS.

Table 5.1 Consistency with Yarralumla Neighbourhood Plan

Strategies for Future Residential Areas	Consistency (Y/N)	Comments
Key Strategies for all Residential Areas		
Provide a diversity of housing choice for singles, couples and families of different sizes and ages in appropriate locations	**Y**	A mixture of housing options is proposed, including low-density dwellings, terraces and apartments.
Promote high-quality residential development that is sympathetic to the existing garden suburb neighbourhood character in terms of scale, form and landscape setting	**Y**	The primary design principle guiding the Proposal was the 'garden setting' to ensure consistency with Canberra's Garden City principles. This is reflected in the low bulk and scale of the proposed buildings, extensive landscaping, and creation of parkland.

Strategies for Future Residential Areas	Consistency (Y/N)	Comments
General Strategies		
Maintain the high-quality landscape setting and abundance of mature and healthy street trees on both public and private land	**Y**	High-quality landscaping is a dominant and priority feature of the Proposal. Most of the existing poor-quality trees would be removed from the site for public safety and replaced with a mixture of deciduous and non-deciduous trees, where appropriate, throughout the site (refer to **Section 9.0**).
Ensure the provision of appropriate housing for the aged, retired and disabled in central rather than peripheral locations within easy access to shops, public transport and community facilities	**Y**	Pedestrian access via Bentham Street provides a 10-minute walk to the local Yarralumla shops and bus stops on Novar Street.
Maintain and enhance the existing street pattern by ensuring buildings relate to the street rather than detract from it	**Y**	The proposed street pattern has been designed to reflect the surrounding road network. The Proposal has also sought to minimise building bulk and scale, thereby enhancing the proposed landscaping, and maintaining Garden City urban design principles.
Retain and reinforce the backdrops, vistas and view corridors that are part of the suburb's identity, including those to Black Mountain, Red Hill, Capital Hill, Lake Burley Griffin and the Brindabella Ranges	**Y**	The maximum building height across the site would be three storeys. This would ensure that any significant views to surrounding landscapes and features would be maintained.
Continue to provide a mix of public and private housing	**-**	Not applicable – the Proponent is a private landowner.
Conserve heritage places and spaces	**Y**	The Proposal seeks to conserve and enhance the heritage interpretation of the CBP. The design of the Proposal has sought to adaptively reuse, whilst maintaining the integrity of, the core heritage precinct within the Proposal Area (refer to **Section 17.0**).
Maximise permeable surfaces to reduce run-off and erosion and assist hydration	**Y**	The Proposal provides extensive areas of landscaping and parkland, including a new Quarry Park, to reduce hard surfaces and encourage a Garden City design (refer to **Section 10.0**).
Safeguard privacy and maximise and maintain light and sun access to dwellings	**Y**	The Proposal maintains privacy to surrounding properties through optimised landscaping along the perimeter and throughout the CBP. The proposed design also seeks to maximise north-facing buildings to assist in maintaining light and sun access (refer to **Section 12.0**).

Strategies for Future Residential Areas	Consistency (Y/N)	Comments
Protect, maintain and replace street trees	**Y**	The Proposal will replace and augment most of the trees within the CBP, resulting in an increased canopy cover and consistent with the Garden City aesthetic, particularly along newly created streets.
Landscape design associated with new developments should include the replacement of existing trees in order to maximise tree canopy. The drip-line of existing significant trees is to be respected	**Y**	The Proposal will replace and augment most of the trees within the CBP, resulting in an increased canopy cover and Garden City aesthetic.
Promote residential development that facilitates a reduction in water and energy consumption	**Y**	The Proposal is exploring renewable energy options, including the possibility of introducing a rooftop photovoltaic system integrated with battery storage. The design of the Proposal also seeks to maximise north-facing buildings and cross ventilation to minimise energy use. The Proposal reuses all stormwater from within the Proposal Area for irrigation purposes.
Encourage residential redevelopment around parks and laneways to focus on these assets in order to increase passive surveillance and family-friendly environments	**Y**	The primary design principle guiding the Proposal was the 'garden setting' to ensure consistency with Canberra's Garden City Principles. This is reflected in the low bulk and scale of the proposed buildings, extensive landscaping, and creation of parkland. The design of the Proposal has sought to provide CPTED outcomes, including the infilling of the north-eastern quarry spur.
Explore adaptable housing opportunities	**Y**	The Proposal would provide universal access to all buildings. Further exploration of adaptable housing design would be considered during the DA stage.
Streetscapes in Yarralumla that are recognised by the ACT Planning and Land Authority as significant are as follows: Arkana Street, Broome Crescent, Ewart Street, Francis Street, Gunn Street, Hampton Circuit, Hunter Street, Hutt Street, Irwin Street, Loftus Street, MacGillivray Street, Mueller Street, Newman Street, Novar Street, Rodway Street, Schlich Street, Weston Street, Banks Street and Solander Place. The ACT Planning and Land Authority requires detailed contextual analysis for any redevelopments in these streets to ensure the amenity is maintained and enhanced. (Please note that the ACT Planning and Land Authority reserves the right to reconsider the above listing should circumstances change.)	**-**	Not applicable.

Strategies for Future Residential Areas	Consistency (Y/N)	Comments
Ensure any future developments have an acceptable Waste Management Plan and adhere to the Development Control Code for Best Practice Waste Management so that waste and recycling is stored correctly and separately within lease boundaries, and access is provided for domestic collection vehicles	**Y**	An industry best practice Operational Environmental Management Plan (OEMP) would be prepared prior to occupation of the site, which would include a waste management plan (refer to **Section 8.0**).
Ensure all residential developments facilitate a reduction in water and energy consumption	**Y**	The Proposal is exploring renewable energy options, including the possibility of introducing a rooftop photovoltaic system integrated with battery storage. The design of the Proposal also seeks to maximise north-facing buildings and cross ventilation to minimise energy use. The Proposal reuses all stormwater from within the Proposal Area for irrigation purposes.

In addition, the Proposal has been subject to extensive community consultation (refer to **Section 19.0**) which has informed the design approach for the redevelopment.

Subject to the approval of this EIS, the detailed design of the proposed development would be subject to merit track assessment under the PD Act. Furthermore, if the Proposal is approved for development, the construction and operation of the redevelopment would be managed by a CEMP and OEMP, respectively.

As a result, it is considered unlikely that the Proposal would be inconsistent or non-compliant with any planning policies or approvals.

5.4.2 Failure to Implement Appropriate Management Measures

The Proponent is committed to implementing the management and mitigation measures outlined within this EIS. These management measures are considered to be best industry construction and development practice. The Proponent has an excellent track-record of delivering safe, quality-built developments in the ACT and around Australia. No environmental proceedings have been made against the Proponent to date.

To ensure the appropriate measures are implemented, and that there is compliance with relevant approvals, the Proponent also commits to appointing an independent third party to conduct audits on environmental approvals and performance against criteria identified within the CEMP. The risk assessment within this EIS would also be revised throughout the life of the Proposal (until fully operational) to ensure all risks are identified and adequately addressed.

5.4.3 Constraints to Surrounding Land Uses and Future Development

The Proponent is cognisant of the overall neighbourhood and streetscape of Yarralumla and the local community's desire to preserve the suburb's integrity. This is based on extensive community consultation undertaken to date, which was incorporated into the tender process. The intent of the redevelopment of the CBP is therefore to harmonise the Proposal Area into the wider suburb from an aesthetic perspective, complementing the surrounding land uses and providing new opportunities for recreation and active transport to residents from across the suburb.

No hazardous or offensive development is proposed as part of the redevelopment.

A low-density zone would also be provided at the eastern end of the site as this area provides the greatest interface with existing neighbours (refer to **Figure 5.1**). Generally, density of housing on the CBP site increases towards the west of the site which interfaces with the golf course.

The proposed redevelopment is considered unlikely to result in the sterilisation of surrounding land uses. As discussed in **Section 5.4.1**, the Proposal is consistent with all existing planning policies for the area and seeks to maintain the existing character of the area.

It is therefore considered that the land uses proposed for the CBP are consistent with surrounding areas and no impact to the current or future use of surrounding land is expected.

5.5 Proposed Mitigation Measures and Offsets

A CEMP and OEMP would be prepared for the Proposal. These would be submitted to the EPSDD for approval prior to construction commencing within the Proposal Area.

In addition to the CEMP and OEMP, key mitigation and management measures proposed for the CBP redevelopment to reduce environmental impacts associated with land use and planning are summarised below:

- Ensure detailed design is consistent with all relevant planning legislation, policies and any approvals issued for the Proposal, particularly those under the PD Act and EPBC Act.
- Design works so they occur wholly within approved areas, including mitigation measure for indirect impacts and offsite works.
- Ensure the entirety of the site is adequately assessed and that impacts outside the CBP are considered.
- Seek appropriate approvals for any proposed actions that are inconsistent with the approved design.
- Appoint an independent third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits would be reported back to the EPSDD and other agencies as appropriate.
- Design the Proposal with consideration for the Canberra Brickworks Conservation Management Plan and the updated Canberra Brickworks Conservation Management Plan (GML, 2021a).
- Design the Proposal with extensive consultation with the surrounding Yarralumla community and with consideration for the Yarralumla Neighbourhood Plan.

- Undertake environmental impact assessment of the proposed development and incorporate appropriate management measures as part of the Proposal.
- Re-evaluate the risk assessment throughout the life of the Proposal (until fully operational) as additional information becomes available to ensure all potential environment impacts are adequately identified and assessed.

The application of these key mitigation measures against the identified risks (refer to **Section 5.1**) and the associated residual risk assessment is outlined below in **Section 5.6**. Correlation of the management actions to the assessed risks will also facilitate the incorporation of Environmental Management System (EMS) principles into the CEMP and OEMP. This will be enabled by identification of ineffective measures according to any incidents that are recorded and the resultant continuous improvement actions to address weaknesses which will be targeted against specific issues.

Accordingly, the risk assessment prepared for this EIS will need to be adapted into the CEMP and OEMP with any additional conditions that arise through the approval process to ensure threats to the environment, community and other factors are addressed.

5.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
A1	Ensure detailed design is consistent with all relevant planning legislation, policies and any approvals issued for the Proposal, particularly those under the PD Act and EPBC Act. Design works so they occur wholly within approved areas, including mitigation measures for indirect impacts and offsite works.	1-remote	4-major	W	Yes
A2	Ensure detailed design is consistent with all relevant planning legislation, policies and any approvals issued for the Proposal, particularly those under the PD Act and EPBC Act. Seek appropriate approvals or any proposed actions that are inconsistent with the approved design.	1-remote	4-major	W	Yes
PL1	Design the Proposal with consideration for the Canberra Brickworks Conservation Management Plan and the updated Canberra Brickworks Conservation Management Plan (GML, 2021a). Design the Proposal with extensive consultation with the surrounding Yarralumla community and with consideration for the Yarralumla Neighbourhood Plan.	1-remote	3-moderate	L	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
A3	Undertake environmental impact assessment of the proposed development and incorporate appropriate management measures as part of the proposal.	1-remote	4-major	W	Yes
Construction					
A4	Appoint an independent third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits would be reported back to the EPSDD and other agencies as appropriate.	2-unlikely	3-moderate	W	Yes
A5	Re-evaluate the risk assessment throughout the life of the Proposal (until fully operational) as additional information becomes available to ensure all potential environment impacts are adequately identified and assessed.	2-unlikely	3-moderate	W	Yes
Operation					
PL2	No mitigation required. Land uses are consistent with surrounding areas and would be revitalising a long-term brownfield site. No impact to the use of surrounding land uses is expected.	2-unlikely	3-moderate	W	Yes

It is apparent through the mitigation measures proposed that the environmental risks associated with land use and planning would be adequately reduced to as low as reasonably practicable. No significant impacts are anticipated.

6.0 Utilities

Section Summary
This Section provides an assessment of the potential impacts associated with the provision of utilities for the Proposal. It considers the existing utilities and their capacities, as well as the proposed alterations, relocations, and connections required to accommodate the Proposal.

6.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
U1	Existing services do not have the capacity to service the site.	3-possible	3-moderate	M	No
U2	Requirement to install new infrastructure to service the development impacts existing infrastructure and existing users.	3-possible	3-moderate	M	No
Construction					
U3	Construction activities result in damage to utilities and other essential infrastructure.	3-possible	3-moderate	M	No
U4	Construction staging of utilities and other essential infrastructure are not considered in relation to broader development, resulting in additional impacts to surrounding residents and local community.	3-possible	3-moderate	M	No

6.2 Existing Conditions and Values

The existing utilities available on the CBP site and in the immediate surrounding area are shown on **Figure 6.1** while the proposed utilities are shown on **Figure 6.2**, and discussed below.

6.2.1 Water Supply

External to the Proposal Area, there is an existing 150 mm diameter water main to the north in Bentham Street which extends to Lane-Poole Place. Mains to the south of the site in Denman Street and surrounding streets are of 100 mm diameter, the exception being a 150 mm diameter water main in Woolls Street.

The Proposal Area has an existing connection to the 100 mm diameter water main in Denman Street. Internal to the Proposal Area is a 100 mm diameter ring main which is an Icon Water asset. Water is reticulated to the existing buildings from this main. There is no easement over the ring main.

6.2.2 Stormwater

Surface water flow has been significantly modified by the historic use of the site, especially relating to the quarry use and fill. The main catchment in the Proposal Area encompasses the brickworks, quarry, former workers accommodation and cleared land off Denman Street. Surface water runoff from this catchment drains to the north-west corner then via a drainage reserve through the Royal Canberra Golf Club into the Warrina Inlet of Lake Burley Griffin. The drainage reserve includes both piped infrastructure and an overland flow path. This is further discussed in **Section 10.0** of this EIS.

Stormwater mains external to the site are located to the north and west. The main progressively increases in diameter from 450 to 900 mm in diameter. The alignment is parallel to that of the sewer main which drains the Lane-Poole Place residential area and the CBP.

6.2.3 Sewerage

There are no Icon Water-owned sewerage assets located on the site.

An existing 150 mm diameter sewer main is located in the southern verge of Lane-Poole Place. This main continues through the laneway at the end of Lane-Poole Place west for approximately 90 m, south-west for approximately 70 m, then turns north-west and enters the Royal Canberra Golf Club (refer to **Figure 6.1**). The sewer main is located within road reserves or unleased Territory land prior to entering the golf course.

The existing connection for the CBP site is to the sewer main in the laneway at the end of Lane-Poole Place. There is a 150 mm diameter sewer main to the north-east of the site in Bentham Street.

6.2.4 Gas

There are no known gas utility assets within the Proposal Area; however, there is a 63 mm diameter gas main in Bentham Street and a 40 mm diameter main in Denman Street.

6.2.5 Electricity

An existing 11 kV High Voltage (HV) overhead line originates from the corner of Woolls Street and Denman Street and connects to the existing Brickworks building for incoming power supply to the Proposal Area.

6.2.6 Telecommunications

Optus telecommunications infrastructure is located outside of the CBP boundaries, to the north-east of the site on Bentham Street and is not required to be relocated.

Telstra telecommunications infrastructure is located inside the eastern boundary of the Proposal Area from north of Woolls Street to south of Bentham Street.

The Intra-government Communications Network (ICON) also has an existing service reticulating south between Denman Street and Dudley Street. This service runs parallel to the existing HV overhead lines.

6.3 Investigations

Predicted demands for utilities have been assessed by Sellick Consultants Pty Ltd (Sellick) and S4B Studio, and the resultant requirements for the provision of utility services to the CBP redevelopment are discussed in the following sections.

Icon Water and Evo Energy have been consulted throughout the design process.

No unlicensed regulated activities as defined in the *Utilities Act 2000* or the *Utilities (Technical Regulation) Act 2014* are proposed for the CBP redevelopment.

The following investigations and plans have been prepared to inform this section:

- A Final Concept Pond Design (Alluvium, 2016) was prepared in order to develop the concept for a proposed stormwater treatment pond and wetland. This investigation is provided in Appendix F13 in **Appendix F** and is further discussed in **Section 10.0** of this EIS.
- A Stormwater Treatment System Report (Alluvium, 2022) has also been prepared to determine urban design flow volumes and treatment requirements following urban development (refer to **Section 10.0** and Appendix F14 in **Appendix F**).
- The Stormwater Masterplan (Sellick, 2022a) is provided in Appendix F01 in **Appendix F**.
- The Water and Sewer Masterplans (Sellick, 2022b) are provided in Appendix F02 in **Appendix F**.
- The Electrical Infrastructure Plan and Maximum Demand Calculations (S4B, 2022) are provided in Appendix F03 in **Appendix F**.
- The Communications Infrastructure Plan (S4B, 2021) is provided in Appendix F04 in **Appendix F**.

6.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for utilities in **Section 6.1** above, the potential impacts of the proposed redevelopment of the CBP relating to utilities may be characterised as:

- Existing services do not have the capacity to service the site, and
- Impacts to existing and proposed utilities cause loss or change in service to existing users.

These potential impacts are analysed in detail below.

6.4.1 Lack of System Capacity

The investigations outlined in **Section 6.3** have indicated that existing services do not have the required capacity to service the proposed CBP redevelopment. As such, new infrastructure is required to service the CBP. This is further discussed for each utility below. In all instances appropriate designs for new and/or augmented systems have been developed to ensure continuity of supply to both the CBP and the surrounding suburb.

6.4.1.1 Water Supply

Estimated potable water demand from the proposed CBP redevelopment is 13.30 L/sec. Fire demand is estimated at 45 L/sec, being consistent with the assessed Fire Risk Category of F5, in accordance with the Water Supply and Sewerage Standards[6] published by Icon Water. There is adequate pressure within the existing water supply network; however, mains within the vicinity of the site are not of adequate size to deliver the future demands for the Proposal.

Two options were considered for the provision of water supply to the CBP. The first was a new water main in Denman Street from Novar Street. The second was a new water main from the existing water main in Dudley Street. The Denman Street option has now been adopted, through consultation with Icon Water.

A new 150 mm diameter water main is to be installed in Denman Street and Kintore Crescent connecting to the existing network at Novar Street to supply the proposed development. Records provided by Icon Water indicate that the water main in Denman Street is located within the verge, and therefore relocation of this existing main is not required to enable connection to the new main.

The existing water supply connection, associated water meters and all internal mains and reticulation within the CBP are to be disconnected and removed as part of the Proposal. New 150 mm diameter water mains are proposed throughout the CBP. Three new connections to the existing network are also proposed. These would link to the new main in Denman Street and existing mains in Bentham Street and Lane-Poole Place.

New water mains within the CBP site would be either located in road reserves or unleased land or would be contained in easements to the satisfaction of Icon Water. These easements are shown on the relevant Sewer and Water Masterplans (refer to Appendix F02 in **Appendix F**).

Rainwater harvesting is also proposed from all buildings within the Proposal. The harvested water would only be used for irrigation in order to meet water quality treatment targets (refer to **Section 10.0**).

These proposed installations and connections would ensure sufficient water capacity and supply to the Proposal.

6.4.1.2 Stormwater

The proposed redevelopment includes a wetland and pond located in the old quarry within the CBP, where there is an existing depression. The wetland would receive inflow from the combined sub-catchments within the site, with the 3-month Average Recurrence Interval (ARI) being diverted into a sediment basin, then flowing into a macrophyte zone, and finally the pond (Alluvium, 2016, Appendix F13 in **Appendix F**). The wetland and pond have been designed with consideration for the ACT Practice Guidelines for Water Sensitive Urban Design (WSUD) (ACT Government, 2017b) and Melbourne Water's WSUD Engineering Procedures: Stormwater (2005).

[6] https://www.iconwater.com.au/Developers-and-Renovators/Water-and-Sewerage-Service-Standards-and-Guidelines/New-Icon-Water-water-supply-and-sewerage-standards.aspx

Estimated volume of the pond is expected to be 15 to 20 ML. The pond depth has been designed at 1.5 m. In addition, the Proposal includes a water quality treatment strategy based on the above guidelines, which includes:

- Diverting the 3-month flow (4 exceedances per year) for the development at the low point in the north-west boundary and pumping this flow to the treatment assets. High flows are bypassed to an on-site retention tank for landscape irrigation purposes.
- Installation of rainwater tanks to the southern portion of the Proposal Area for open space irrigation (active and passive irrigation).
- The existing quarry pond will be converted to accommodate a sediment basin, wetland and pond.
- Treated stormwater from the pond will enter the on-site retention tank for landscape irrigation purposes.

Based on the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) modelling and water quality treatment strategy proposed (refer to Appendix F14 in **Appendix F**), it is apparent that the proposed redevelopment would be able to sufficiently manage stormwater on the site. Consideration for low water flow is provided in **Section 10.0.**

However, it is noted within the Stormwater Treatment Systems Report (Alluvium, 2022; refer to Appendix F14 in **Appendix F**) that there are insufficient flows to make reuse of stormwater for toilet flushing feasible (i.e., very low reliability for meeting the larger demand). As unreliable sanitation would present a potential health risk to residents, it was determined that the Proposal would only provide connection to gardens and green spaces.

Appendix F includes the Stormwater Master Plan (Sellick, 2022a, Appendix F01 in **Appendix F**), which demonstrates the infrastructure proposed to ensure stormwater is appropriately managed within the Proposal Area.

Having regard for the extensive planning and design for stormwater treatment included in the Proposal, it is considered that the proposed redevelopment of the CPB would have sufficient capacity to treat stormwater on the site to ensure any discharge meets WSUD requirements. Refer to Appendix B of the Stormwater Treatment Systems Report (Alluvium, 2022, Appendix F14 in **Appendix F**) which includes the WSUD estate development checklist.

6.4.1.3 Sewerage

The sewer main described in **Section 6.2.3** services the existing residential area of Lane-Poole Place and would be the main connection for the proposed CBP development site, with the exception of five of the proposed residential blocks on Bentham Street which would be connected to the main in that street.

The sewerage design flow for the main catchment which includes the bulk of the CBP, and the existing Lane-Poole Place residential area is 18.61 L/sec. The design flow for the Bentham Street catchment is 0.54 L/sec. Icon Water has advised that there is adequate capacity in the sewerage network to accept the additional flows generated by the development of the CBP. No upgrades to these mains are required or proposed.

The existing sewer connection and internal sanitary drains within the Proposal Area are to be disconnected and removed. Four new 150 mm diameter sewer mains are proposed to service the various blocks within the CBP. Two of these mains would be located external to the Proposal Area:

- The first would be located in Block 1 Section 127 to the west of the site for a distance of approximately 110 m.
- The second comprises a new main in Bentham Street to service the single residential blocks in that catchment.

These two mains would be subject to separate development applications.

These four new sewer mains would be connected to the existing network. The primary connection to the Proposal Area would be to the sewer main to the west of the site near where it enters the Royal Canberra Golf Club. This connection would service the bulk of the Proposal Area. A second connection, to be made at the same location, would service the multi-unit residential complex immediately adjacent to the western boundary. The third connection would be to the main in the laneway near the end of Lane-Poole Place. This connection would service the commercial hub of the CBP development. The fourth connection would be to the existing main in Bentham Street.

These proposed sewer connections and installations would provide sufficient capacity and service to the proposed CBP redevelopment. Onsite sewerage treatment was not considered to be viable due to limited stormwater flows available. As such, any onsite treatment would require use of ACT water supply systems. The risk of unpleasant odours would also detract from the Proposal, impacting the site's heritage significance and ability to be adaptively reused.

6.4.1.4 Gas

Some gas services may be provided to the Proposal Area, to both residential and commercial properties. However, this is likely to be limited to houses/townhouses, commercial cooking and fireplaces. This will be further investigated and assessed during the development application (DA) phase of the Proposal.

The Proponent understands and acknowledges concerns raised regarding the installation of gas into the proposed development. Evoenergy, Canberra's local energy distributor responsible for operating and maintain the gas distribution network infrastructure in the ACT, is committed to working with the ACT Government to transition the ACT's gas network to achieve the government's target of net zero emissions by 2045.

The existing gas network has the potential to assist in meeting this target by transitioning to renewable gas. At present, Evoenergy distributes natural gas, but has noted that there are renewable gases that can be used in the network instead of natural gas, including hydrogen and biomethane. They have advised the Proponent that they are working closely with the ACT Government on research into the use of hydrogen and biomethane, and testing how the network may be able to distribute these renewable gases to consumers. The Proponent has been advised that initial results are encouraging and that renewable gas is likely to play an important role in reducing carbon emissions in the ACT's energy system.

It is noted that, each year, due to Canberra's cold climate, gas accounts for over 40% of Canberra's annual energy needs, concentrated into the five cold months of the year. This usage pattern for gas also represents two and half to three times the daily electricity peak during winter in the mornings. This demand profile makes replacing gas for electricity difficult and generally not viable, as gas networks are better able to handle 'peaky' energy demand profiles. In addition, each year the number of customers connected to the ACT gas network grows by one to three percent which has been steady over time. This demonstrates an ongoing demand for gas and gas connections.

In addition, current suburban developments have narrower verges than pre-2000. Gas networks also face different economic regulatory requirements now as well. These two factors preclude laying gas networks after the development is established unless a reserved alignment for future gas reticulation is provided. If gas networks are not installed for new residential developments, this means that residents of these new developments won't be able to access and take advantage of renewable gas (such as biomethane or hydrogen) when these are introduced into the gas network in the future. The installation of gas infrastructure is therefore essential to ensuring alternative energy options, such as hydrogen and biomethane, are available to residents in the future.

The Proponent therefore sees the use of natural gas as a transitory energy source for the CBP. With Evoenergy committed to implementing decarbonisation solutions, the provision of gas infrastructure will ensure that the CBP will have access to safe, reliable and affordable energy in the medium term, and the ability to adapt to a net zero emissions energy system in the longer term.

6.4.1.5 Electricity

The total maximum demand for the Proposal is expected to be approximately 3,560 kVA. The breakdown of this calculation is provided in Appendix F03 in **Appendix F**.

The existing 11 kV HV overhead line reticulating south between Denman Street and Dudley Street would be placed underground to suit the new road within this section of the Proposal. A service easement would be provided along the entire length of the route between Denman Street and Dudley Street.

Within the Proposal Area, the existing 11 kV overhead line would also be placed underground, and additional new underground HV supply would originate from supply authority pole 62691 at the Woolls Street/Denman Street intersection, with a new HV switching station located at the site development boundary. Five substations are proposed throughout the Proposal Area (refer to Appendix F03 in **Appendix F**).

The Proponent has undertaken consultation with service provider Evoenergy. This consultation would remain ongoing throughout detailed design and construction of the Proposal.

The proposed electricity installations would provide sufficient capacity and service to the proposed CBP redevelopment.

6.4.1.6 Telecommunications

The existing Telstra service would be relocated to suit the new residential property boundaries. The existing ICON service would be relocated to suit the new roadway from Dudley Street.

The National Broadband Network (NBN) is available for the Proposal Area. The Proposal would provide network infrastructure in accordance with NBN Co. requirements. A Fibre Distribution Hub (FDH) would be located at the development boundary for connectivity back to the telecommunications service providers' fibre distribution networks. A separate FDH would be provided for each service provided.

A local network of five 100 mm P100 conduits would be provided for trunk service reticulation within the Proposal Area (refer to Appendix F04 in **Appendix F**). This would provide individual P100 conduits for Telstra, Optus, NBN and Transact along with a spare conduit for potential deployment of a dedicated precinct network. The conduits would be installed along the property boundary before connecting into local network connection pits (Type 8 pits) which in turn would branch off to service multiple local access pits (Type 5 pits). A local access pit would service between four and eight residential premises. Separate pits would be required for each service provider.

The proposed installations and connections would ensure adequate telecommunications provision to the Proposal.

6.4.2 Construction Impacts

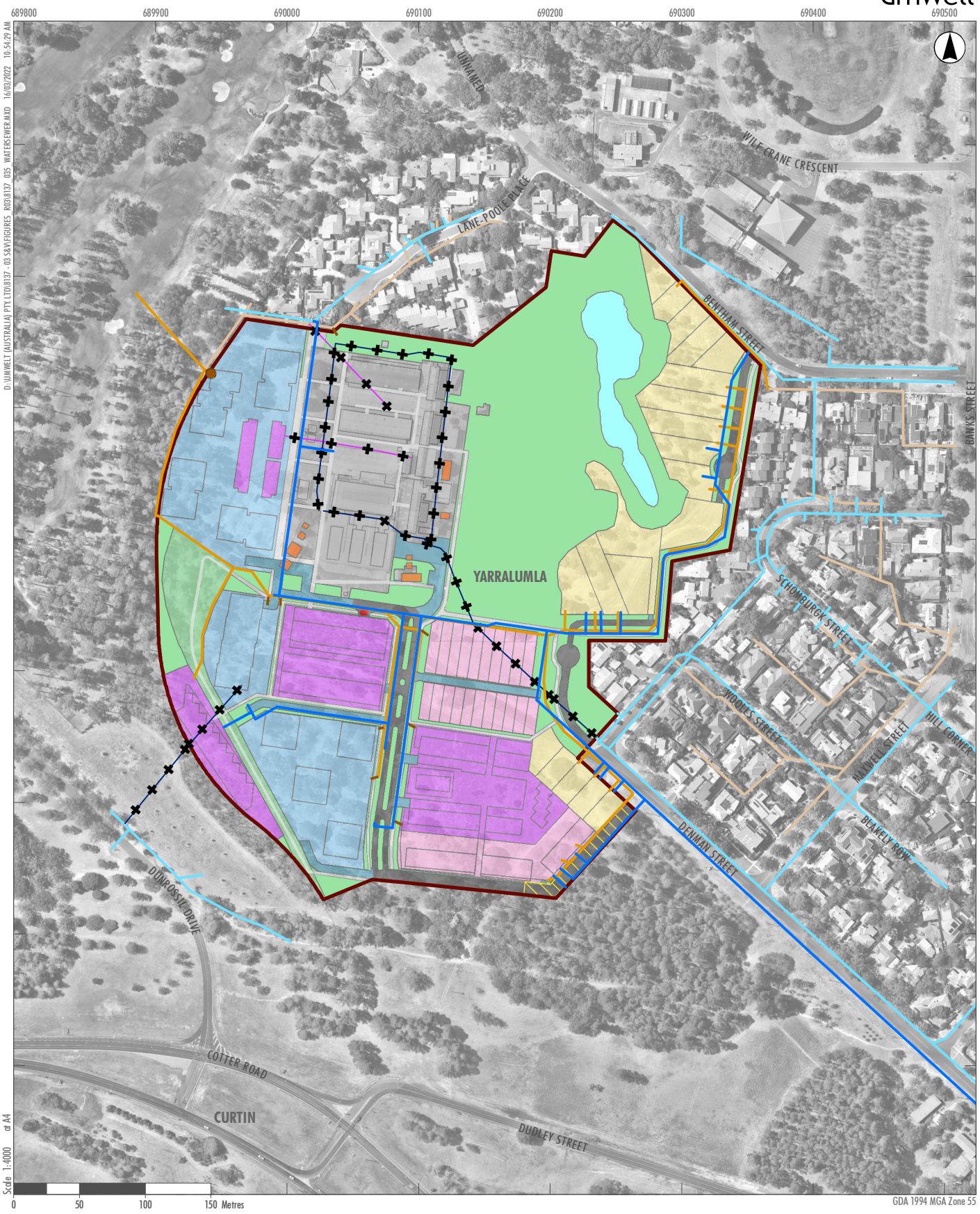
Impacts on existing infrastructure throughout the construction period are envisaged to be short term only. All works on live water and sewer mains would be undertaken by Icon Water. The Proponent would collaborate with Icon Water, other utility providers and the ACT Government to minimise construction timing impacts to surrounding residents.

During the installation of off-site works, normal construction practices would be utilised to minimise the impact on existing infrastructure, traffic movements and access to existing residences and the Uniting Church. These practices would be detailed and implemented through a CEMP.

The new water main which is to be installed in Denman Street and Kintore Crescent is generally clear of other utility services, the exception being a short length in Kintore Crescent where it would be adjacent to an existing sewer main.

The sewer connection in Bentham Street is located in the residential driveway of numbers 46 and 48 Bentham Street. Liaison with the homeowners would be undertaken with respect to access during construction and post-construction reinstatement of the driveway.

It is considered that all potential impacts associated with utility construction can be sufficiently managed through the implementation of a CEMP and ongoing consultation with utility providers and relevant neighbouring property owners.



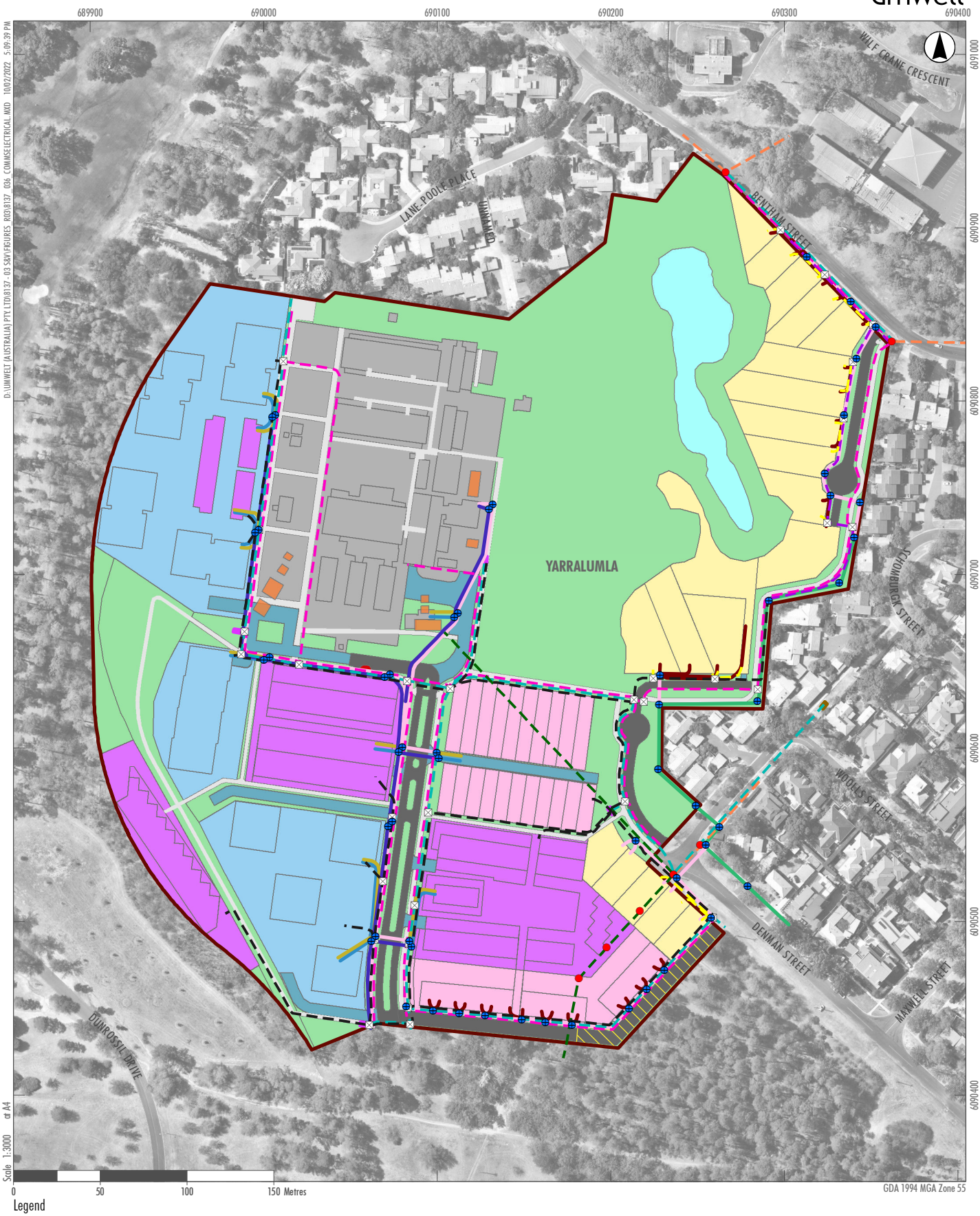
Legend

- Proposal Area
- Apartment Typology
- Heritage Precinct
- Single Dwelling Block with Community Title Scheme
- Single Dwelling Lots
- Terrace Typology
- Open Space
- Water
- Community Title Road / Driveway
- Public Carpark Entry
- Public Roads
- Shared/Footpath
- Inner Asset Protection Zone
- Structures to be Demolished
- Existing Water Main
- Existing Sewer Main
- Water main to be disconnected
- Sewer main to be disconnected
- Proposed Water Main
- Proposed Sewer Mains
- Sewer Manholes and Pipe End Cap

FIGURE 6.1

Water and Sewer Utilities

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2020); S+B (2021)



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- Public Roads
- Shared/Footpath
- Inner Asset Protection Zone
- Structures to be Demolished
- Existing Substation
- Proposed Substation
- Electrical Pits

Electical Utilities

- Existing High Voltage
- Existing Overhead High Voltage
- New Street Lighting Underground Conducit
- 1 x 125mm low voltage underground conduit
- 2 x 125mm high voltage underground and communication conduit
- 2 x 125mm low voltage underground conduit
- 2 x 50mm low voltage underground conduit
- Poles

Communication Utilities

- Existing NBN
- 1 x 100mm Transact White Communication Conduit
- 1 x 50mm Transact White Communication Conduit
- 1 x NBN P100 White Communication Conduit
- 1 x NBN P23 White Communication Conduit
- 1 x NBN P50 White Communication Conduit
- Communication Pits

FIGURE 6.2

Electical and Communication Utilities

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2020); S+B (2021)

6.5 Proposed Mitigation Measures and Offsets

A CEMP and OEMP would be prepared for the Proposal. These would be submitted to the EPSDD for approval prior to construction commencing within the Proposal Area.

In addition to the CEMP and OEMP, key mitigation and management measures proposed for the CBP redevelopment to reduce environmental impacts associated with the provision of utilities are summarised below:

- Consult and collaborate with utility entities and the ACT Government during detailed design and construction to ensure impacts to existing services are adequately managed and that construction staging is considered.
- Consider utility installation constraints during detailed design phase to ensure the new infrastructure integrates with existing system.
- Mark and/or map the location of utilities at risk of damage and provide to contractors prior to construction commencing.
- Use hazard identification tools in accordance with WHS standards to identify potential risks to workers.
- Collaborate with utility providers and ACT Government to ensure construction staging minimises impacts to surrounding residential area.

The application of these mitigation measures to the risks identified in **Section 6.1** and the associated residual risk assessment is outlined below in **Section 6.6**.

6.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
U1	Consult with utility entities and ACT Government early in design phase. Consider utility installation constraints during detailed design phase to ensure the new infrastructure integrates with existing system.	2-unlikely	3-moderate	W	Yes
U2	Consult with utility entities and ACT Government early in design phase. Consider utility installation constraints during detailed design phase to ensure the new infrastructure integrates with existing system.	2-unlikely	3-moderate	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Construction					
U3	Collaborate with utility and service providers to determine the location and risk of damage of services prior to construction commencing. Mark and/or map the location of utilities at risk of damage and provide to contractors prior to construction commencing. Use hazard identification tools in accordance with WHS standards to identify potential risks to workers.	2-unlikely	3-moderate	W	Yes
U4	Collaborate with utility providers and ACT Government to ensure construction staging minimises impacts to surrounding residential area.	2-unlikely	3-moderate	W	Yes

It is apparent through the mitigation measures proposed that the environmental risks associated with utilities would be adequately reduced to as low as reasonably practicable. No significant impacts are anticipated.

7.0 Traffic and Transport

Section Summary
This Section provides an assessment of potential impacts to traffic and transport within the local area as a result of the Proposal. The assessment primarily focuses on operational impacts, with construction management strategies to be provided during detailed design.

7.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
T1	Design does not allow for adequate access and carparking, resulting in pressure on surrounding existing road network and potential increase in vehicle collisions.	2-unlikely	4-major	M	No
T2	Site does not have adequate access for transport, including active transport options.	2-unlikely	4-major	M	No
T3	The CBP design does not match the designs for the access road being prepared by the ACT Government, resulting in the roads not aligning.	2-unlikely	4-major	M	No
T4	Uncontrolled access of vehicles and personnel during site investigations results in degradation of adjacent (unapproved) areas through soil compaction, weed introduction, vegetation removal etc. resulting in non-compliance with PD Act approval.	3-possible	3-moderate	M	No
Construction					
T5	Uncontrolled access by vehicles leads to damage to heritage elements or trees to be retained.	2-unlikely	3-moderate	W	No
T6	Intensification of access road use during construction and the impact of heavy rigid vehicular movements on road surfaces.	3-possible	2-minor	W	No
T7	Inability to access the site if the Dudley Street access road is not constructed.	1-remote	2-minor	N	Yes
T8	Increases in traffic flow on surrounding access roads resulting in the potential for increased motor vehicle collisions and/or pedestrian injuries.	2-unlikely	5-catastrophic	H	No

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
T9	Traffic disruptions to local roads as a result of increased volumes during construction.	4-likely	3-moderate	H	No
Operation					
T10	Increased public access to the CBP and new potential conflict points results in impacts to adjacent residents, including traffic congestion, vehicle accidents, and parking issues.	3-possible	4-major	H	No
T11	Roads and infrastructure deteriorate due to increased use requiring more frequent maintenance.	4-likely	2-minor	M	No

7.2 Existing Conditions and Values

7.2.1 Road Network

Based on data from the 2016 Census (ABS, 2016), over 60% of Yarralumla residents travel to work via car. In addition, over 90% of Yarralumla residents indicated that they owned either one or more motor vehicles. As such, vehicular transport is considered to be one of, if not the dominant form of transportation within the area.

Adelaide Avenue and Cotter Road are the main arterial roads which feed traffic into Yarralumla. Novar Street and Hopetoun Circuit are the main north/south connections in the form of urban distributors or major collector roads. These then feed into the minor collectors which include Bentham Street, Weston Street and Schlich Street.

Details on the hierarchy, purpose and design of key roads in the local road network are provided within the Canberra Brickworks Precinct Access Road and Dudley Street Upgrade Preliminary Sketch Plan Report (AECOM, 2017), attached in Appendix F06 in **Appendix F**.

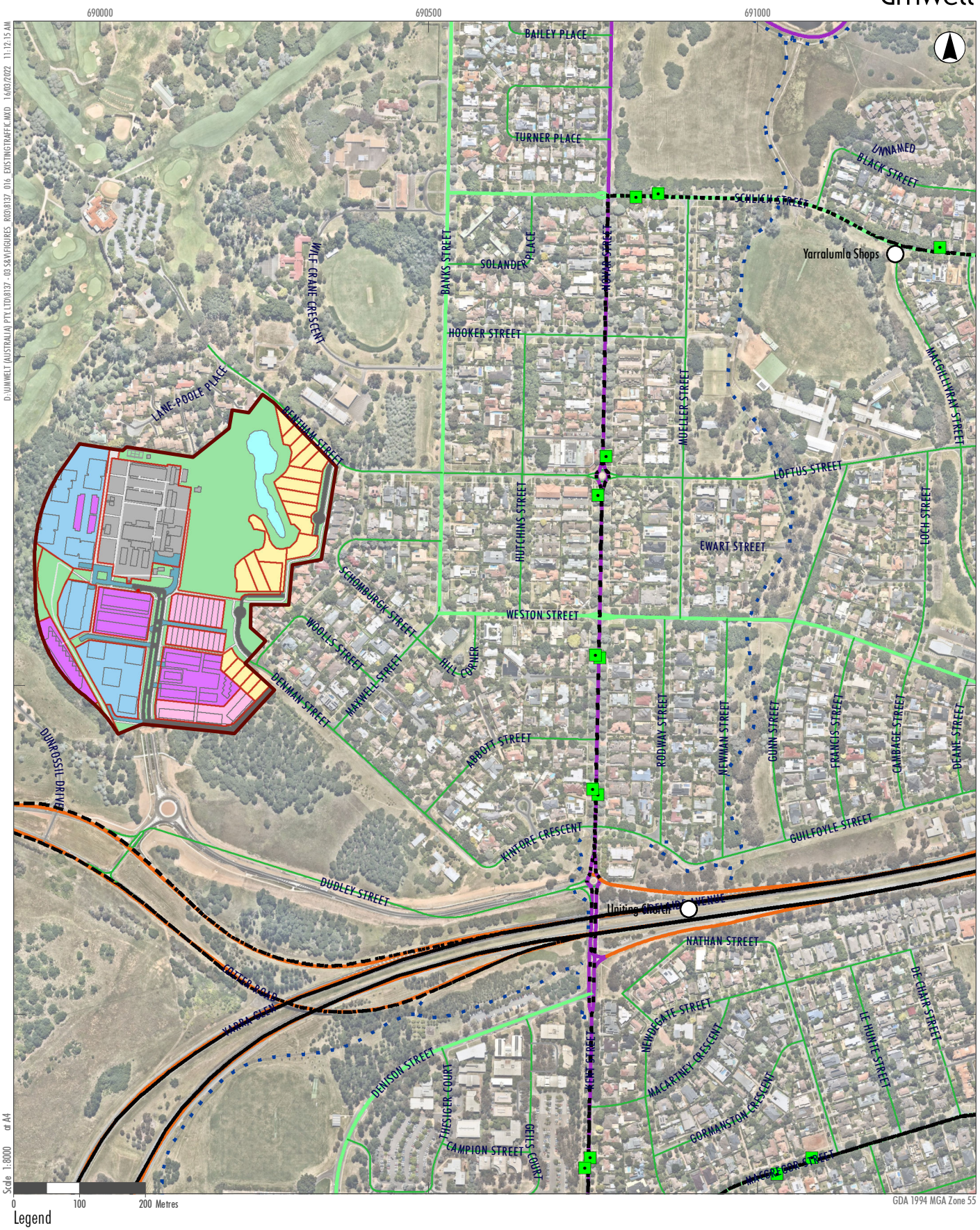
Figure 7.1 below demonstrates the existing road network (at the time of this assessment), with the Proposal included for reference. It is noted that the below figure does not include the approved Brickworks Way (Dudley Street) access road, which was recently completed. Additionally, there are likely to be changes to nearby Kent Street. Similarly, the figure outlines current bus routes and cycle paths that may be subject to change in the future.

Constraints on the existing capacity of the road network were assessed in the Canberra Brickworks Precinct, ACT: Site Investigation - Traffic, Transport & Carparking (AECOM, 2016) attached in Appendix F05 in **Appendix F**. The investigation found that capacity constraints were generally experienced in the weekday AM peak period (between 8.00 am and 9.00 am). Capacity issues were also identified in the weekday PM peak period (between 4.30 pm and 5.30 pm).

The following links in the road network were operating above their intended design volumes when compared to their road classification:

- Weston Street (west of Novar Street).
- Hopetoun Circuit (south of Weston Street).
- Kent Street (between Dennison Street and Dudley Street).
- Dudley Street.

Prior to the upgrade of Dudley Street, the intersection of Dudley Street/Cotter Road (eastbound) experiences significant queuing on the Cotter Road approach in the AM peak, while in the PM peak Dudley Street experiences queues. However, in both peak periods, the indicated level of service for the intersection remains good. The intersection of Dudley Street/Cotter Road (westbound) was considered to be operating effectively (AECOM, 2016; Appendix F05 in **Appendix F**). The Dudley Street upgrade has since been approved and largely constructed to resolve the aforementioned queuing issues.



Legend

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Road Heirarchy

- Urban Arterial
- Urban Distributor
- Urban Residential 1
- Urban Residential 2
- Urban Residential 3
- Bus Routes
- Cyclepaths

- Bus Stops

FIGURE 7.1

Existing Traffic Network

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory

7.2.2 Car Parking

The main parking generators in the area impacting on the Proposal are the Yarralumla shopping centre and the Uniting Church on Denman Street (AECOM, 2016; AECOM 2021) (Appendix F05 and Appendix F08 in **Appendix F**).

Overflow parking at lunch times associated with the restaurant and café trade at the Yarralumla shops occurs on the adjacent streets and parking restrictions generally limit short term parking to one side of these roads. This parking capacity appears adequate for normal demand. The normal church parking demand is also adequately catered for however there is occasional heavy demand for infrequent weekday funerals and the large annual fete.

The on-street parking utilisation throughout Yarralumla is on average very low. The preference of residents to park their vehicles in garages means that generally only up to two vehicles are parked on the street for any local access road. The three observed exceptions to this were the on-street parking in the vicinity of the shops, the on-street parking in the vicinity of the church during peak use periods and on-street parking adjacent to construction zones (AECOM, 2016; AECOM 2021) (Appendix F05 and Appendix F08 in **Appendix F**).

The parking utilisation of the Yarralumla shops on-site supply is at 95% or greater for both weekdays and weekends (AECOM, 2016; AECOM 2021) (Appendix F05 and Appendix F08 in **Appendix F**). The overflow parking associated with the shops is located primarily along Hutchins Street and Bentham Street, west of the shopping complex. The utilisation of the overflow parking is generally low on weekend days and high on weekdays, particularly during the lunch peak period. This is further discussed in Appendix F05 in **Appendix F**.

7.2.3 Public Transport

While there are a large number of bus routes along Adelaide Avenue, including R7 and R10, there are currently no stops which give residents of Yarralumla and Deakin West access to these services and vice versa.

There is currently a single route (route number 57) which services Yarralumla. Service 57 travels between Woden Town Centre and the City Interchange. Within Yarralumla the route travels along Novar Street, Schlich Street and Hopetoun Circuit.

7.2.4 Active Travel

According to the ACT Government[7], 'active travel' is defined as follows:

Active travel means a mode of transport which involves physical activity such as walking and cycling to get from one destination to another - including travel to and from the places we live, work, learn, visit and play. These are some of the most efficient and effective ways to incorporate regular exercise into our daily lives, reducing many long-term health risks and contributing to our mental and physical health and well being.

[7] ACT Government (2021) "Active Travel" accessed via: https://www.accesscanberra.act.gov.au/app/answers/detail/a_id/3878/~/active-travel

Yarralumla has an excellent provision of footpaths with almost all verges containing paths. The quality of the paths is generally reasonable throughout the area, although there are isolated areas of cracking or level differences. However, community consultation has highlighted a need for greater pedestrian access along the recently approved Brickworks Way.

Major trip attractors of shops, schools and churches were reviewed for their travel patterns. The Yarralumla Primary school had a fairly dispersed pedestrian movement and the churches had relatively low pedestrian activity. Informal connections through the suburb along access trails were well worn especially closer to the lake.

On-road cycle lanes are provided along Cotter Road and Adelaide Avenue. There is limited connectivity between the local path network and on-road cycle lanes with only one direct connection near the eastern end of the on-ramp from Novar Street south of the intersection of Guilfoyle Street and Newman Street.

7.2.4.1 Uriarra Track

The Uriarra Track is an old track that linked Uriarra to Queanbeyan prior to Canberra's development as the Nation's Capital. It is understood that sheep were driven to the nearby Yarralumla Wool Shed from Uriarra along this track.

An existing informal trail mimics part of the old Uriarra Track and traverses south of the Proposal Area in an east-west direction. It is noted that the precise alignment of the original Uriarra Track is unknown, with the current trail near the Proposal Area being an estimate of its location. The informal trail would be impacted by the Brickworks Way access road, being a separate project to that assessed in this EIS. The SLA has advised that a pedestrian refuge crossing arrangement or realignment of the track would be provided once the Proposal is operational. This is subject to a separate DA, as outlined in **Section 2.6**, and is not discussed further in this EIS.

7.2.5 Vehicle Accidents

A vehicle accident or crash is defined as any unplanned event involving a road vehicle on a road that results in death, injury or property damage and is reported to the police.

Analysis of the vehicle crash statistics recorded from road crash data between 1 January 2015 to 31 December 2019 shows that many of the crashes were clustered around intersections where there are more conflict points. Based on the ACT Road Crash Heat Map[8] Yarralumla does not appear to have a higher-than-average number of crashes compared to the remainder of the ACT.

In the study area, crashes mostly occurred on approach to Novar Street and Kent Street intersection. There is also a cluster of crashes near the Yarralumla shops area, which is likely due to conflict of vehicles manoeuvring from the car parks. The highest severity of crashes observed in the area was a fatal crash near the intersection of Strickland Crescent and Kent Street. There were also 36 injury crashes observed, which mostly occurred along Cotter Road, Novar Street and Kent Street.

[8] ACT Road Crash Heat Map https://www.data.act.gov.au/Transport/ACT-Road-Crash-Heat-Map/fpvp-ne9q

7.3 Investigations

A number of traffic investigations have been undertaken for the Proposal and surrounding road network. This assessment has been based on the data and analysis provided in the following reports:

- Canberra Brickworks Precinct, ACT: Site Investigation – Traffic, Transport and Carparking (AECOM, 2016) (Appendix F05 in **Appendix F**), prepared for the LDA.
- Draft Canberra Brickworks Precinct Access Road and Dudley Street Upgrade: Preliminary Sketch Plan Report (AECOM, 2017) (Appendix F06 in **Appendix F**), prepared for Civil Infrastructure and Capital Works.
- Kent Street and Novar Street Intersection Upgrade: Traffic Options and Analysis Report (AECOM, 2020) (Appendix F07 in **Appendix F**), prepared for Land Release Infrastructure Transport Canberra and City Services.
- Yarralumla Brickworks Traffic and Parking Report (AECOM, 2021) (Appendix F08 in **Appendix F**), prepared for Canberra Brickworks Developments Pty Ltd.
- Concept EDP – Gazetted Road Plan (Sellick, 2020) (Appendix F09 in **Appendix F**).
- Transport Summary Report – Yarralumla Brickworks (Calibre Consulting, 2022) (Appendix F55 in **Appendix F**), prepared for Doma Group.

Further studies and a Traffic Management Plan will be prepared prior to the DA phase.

7.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for traffic and transport in **Section 7.1** above, the potential impacts of the proposed redevelopment of the CBP relating to traffic and transport may be characterised as:

- Impacts on the surrounding road network due to intensification of road use during construction and the impact of heavy rigid vehicular movements on road surfaces. Also, a general increase in wear and tear on existing road infrastructure is predicted once the CBP is operational.
- Impacts on the surrounding road network and public transport during operation of the Proposal due to increase in population.
- Impacts on local road users in the area surrounding the site due to increases in traffic flow resulting in congestion, accidents and parking issues, during both construction and operation.
- Impacts to sensitive environmental and heritage items on the site caused by construction vehicle access.

These potential impacts are analysed in detail below.

7.4.1 Impacts on Road Network

7.4.1.1 Construction

Temporary impacts to traffic and transport are expected during construction. The main construction-related impacts would be:

- Additional truck movements generated by the need to remove excavated material and deliver equipment and materials to the Proposal Area.
- The temporarily changed conditions of roads during construction, which would potentially impact local traffic patterns, bus operations, and cycling and pedestrian access.
- The presence of a construction workforce which would generate additional local traffic activity.

Construction Access and Traffic Volumes

Construction access will primarily occur from the new Dudley Street access road, to be known as Brickworks Way. Construction of this link has largely been completed and should offer minimal impact to the Proposal. Upgrades to Dudley Street have been built to accommodate buses and other heavy vehicle movements, therefore construction traffic is not expected to deform or damage the pavement. Construction traffic for the Proposal will typically occur outside of peak hours (Calibre Consulting, 2022).

During the civil works stage of the Proposal, construction access will be via Denman Street while the CBP portion of Brickworks Way is completed. There will be low volumes of workers in this stage of the Proposal and no impact on the existing road network is expected (Calibre Consulting, 2022).

If larger vehicles are required to deliver materials, such as low loaders delivering beams or other prefabricated materials or machinery, there may be a need for oversized vehicles to be subject to a separate traffic management plan. Where possible, access to the site compounds will be designed to safely accommodate large vehicles up to B-doubles and those used to move machinery to and from the site. In addition, while these vehicles are turning into or out of the site there may be a need to temporarily close one lane of traffic to allow the safe turning of these vehicles. In this situation, traffic control personnel would be utilised. Any over-sized and over-mass (OSOM) vehicles and loads will be transported outside of peak periods.

A pre-construction dilapidation survey and report of local roads (not subject to works) will be completed prior to construction in conjunction with Roads ACT, to record the existing condition of roads used to access the CBP. These roads will be regularly inspected for damage during and on completion of construction. Any maintenance required to public roads will be highlighted to Roads ACT for resolution, while any damage caused as a direct result of construction vehicles will be repaired by the Proponent.

Construction vehicle access, particularly heavy vehicles, would be managed through a Traffic Management Plan, which would be a sub-plan to the CEMP.

Changed Conditions

It is acknowledged that construction activities would potentially add to existing traffic activity and may temporarily impact local traffic conditions and the amenity of nearby residences and businesses. Some offsite work is required on Denman Street and Bentham Street to allow for connection into the existing road network and the existing active travel network (footpaths). Connection to existing utilities is also required.

However, as aforementioned, construction traffic will primarily occur outside of peak hours. There are no known bus routes that use either Denman Street or will be using Brickworks Way. As such, there is likely to be minimal impact to public transport services within the area.

It is expected that these impacts can be adequately managed through the preparation and implementation of a Traffic Management Plan, which would be prepared as a sub-plan to the CEMP. The CEMP will be prepared prior to the commencement of construction.

7.4.1.2 Operation

The Proposal's primary access would be via Brickworks Way. The access road has been designed as a minor collector road with a central landscaped median. It is reiterated that the external portion of this access road has been proposed and designed by the ACT Government and is not subject to this EIS application.

In response to requests by Transport Canberra and City Services (TCCS), a secondary connection to the CBP is proposed via Denman Street to facilitate traffic distribution and provide alternate emergency access and egress. Cross connection through the Proposal Area will be available to emergency vehicles only and general traffic will not be able to drive between the primary and secondary access points.

For individual residential blocks along the ridge overlooking the Quarry Pond, two culs-de-sac are proposed off both Bentham Street and Denman Street. These culs-de-sac would terminate prior to reaching the furthest blocks at which point a 'woonerf' lane (or shared road) would extend to service them. The culs-de-sac and woonerf lane are assets to be handed back to the ACT Government. In addition to this, individual driveway access provisions for new houses are proposed along the frontages of Bentham Street and Denman Street.

The design of the road network, including the apartment basement entries, aims to reduce the visual impact of cars within the CBP and also prioritise pedestrian and cyclist access. Cycling and pedestrian connections network across the CBP, linking up with Bentham Street, Denman Street, Lane-Poole Place, the Dunrossil Estate and Brickworks Way. Primary pedestrian and cyclist access would be provided from Bentham Street on a new public road cul-de-sac and path on the north-eastern boundary of the site. The pathway would link with the new access to Denman Street, as required by the Emergency Services Agency (ESA) and TCCS. These networks will support active travel links through the site and ensure access integration with Yarralumla.

7.4.2 Impacts on Road Users

As discussed in **Section 7.4.1.1** above, construction vehicle access and parking would be managed under a Traffic Management Plan within the CEMP. Construction vehicles would be required to adhere to existing traffic regulations, including speed limits and parking arrangements.

The operational transport impact of the Proposal was assessed in the Yarralumla Brickworks Traffic and Parking Report (AECOM, 2021) (Appendix F08 in **Appendix F**) while updates to daily traffic generation rates based on changes to the Masterplan were assessed in the Transport Summary Report – Yarralumla Brickworks (Calibre Consulting, 2022) (Appendix F55 in **Appendix F**). Updated modelling of the revised layout of intersections along Kent Street was assessed in the Traffic Options and Analysis Report for the Kent Street/Novar Street Intersection Upgrade (AECOM, 2020) (Appendix F07 in **Appendix F**).

The *ACT Estate Development Code* states that for residential and CZ5 zones the following traffic generation rates are expected:

- 6 vehicles per day per dwelling for multi-unit developments
- 7 vehicles per day per dwelling where the blocks are less than 360 sqm, and
- 8 vehicles per day per dwelling where block size exceeds 360 sqm.

Although the zoning for this site is primarily classified as a CZ6: Leisure and Accommodation Zone, it is expected to operate in a similar manner to a residential zone due to the quantity of residential dwellings proposed, and as such these rates were deemed as acceptable. A 10% peak hour factor was adopted in both commuter peak periods, as identified in the RTA Guide to Traffic Generating Developments version 2.2 (Roads and Traffic Authority NSW (RTA), 2002). The traffic generation rates for the non-residential land uses were also determined based upon rates identified in the RTA publication.

The daily traffic generation rates for each of the proposed land uses for the CBP are provided in **Table 7.1**.

Table 7.1 Daily Traffic Generation, Current vs Previous Masterplan

Land Use	Current Masterplan				Previous Masterplan		
	Units	Yield	Hourly Rate	Trips	Yield	Rate	Trips
Houses	Dwellings	20	0.8	16 vph	18	0.85	15 vph
Townhouses	Dwellings	102	0.7	72 vph	59	0.85	50 vph
Multi-Unit (Apartments)	Dwellings	258	0.6	155 vph	303	0.6	182 vph
Commercial / Office	sqm	1,500	0.02	30 vph	1,500	0.02	30 vph
Food / Beverage	sqm	1,740	0.05	87 vph	1,320	0.05	66 vph
Fitness and Wellness	sqm	2,650	0.03	80 vph	2,310	0.03	69 vph
Medical Health Facility	sqm	0	N/A	0	795	0.104	83 vph
Speciality Retail	sqm	750	0.046	35 vph	0	N/A	0
Total				**475 vph**			**495 vph**

Note: Traffic generation rates for houses and townhouses used in the assessment of the previous Masterplan are higher than those used to assess the current Masterplan. Previous rates were viewed as conservative given the expected behaviour of vehicles from the proposed houses and townhouses, and as such the rates outlined in the ACT Estate Development Code were adopted instead (Calibre Consulting, 2022).

The changes to the development layout between the previous and current Masterplans have resulted in a predicted decrease of 20 vehicles per hour generated from the Proposal. As a result, the expected performance of the network is not expected to worsen under the revised Masterplan and further updates to previous traffic impact modelling undertaken by AECOM (2021) for the surrounding road network were not deemed necessary.

Traffic modelling compared the 2017/2020 base year model to the 2031 future year model, both with and without the Proposal. It is noted that data collected in 2017 was considered the best indicator of base demand due to the significant impact and limitations of collecting traffic data due to Covid-19 in 2020, and traffic models were calibrated accordingly. The 2031 model included the following changes:

- CBP access road (Brickworks Way) and Dudley Street upgrade.
- Kent Street upgrades, which included:
    - signalisation of the Dudley Street/Kent Street, Kent Street/Adelaide Avenue off-ramp and Kent Street/Denison Street intersection, and
    - upgrades to the road alignment along Kent Street.

The model assessed network performance and intersection performance and determined that the proportional impact to the traffic network that can be attributed to the future CBP redevelopment is not significant in terms of increases in delay or level of service operation at key intersections or throughout the study area in 2031 (AECOM, 2021).

The provision of the Dudley Street access road (Brickworks Way) is expected to alleviate pressure from the Proposal on the surrounding road network and would provide safe ingress and egress to the CBP. Furthermore, the Proposal would provide a secondary connection to Denman Street for low volumes of traffic servicing a limited number of residences coupled with emergency access only.

7.4.2.1 Parking Requirements

Car parking requirements for the Proposal would be provided in accordance with Section 3.4 of the Parking and Vehicular Access General Code (PVAGC) (ACT Planning and Land Authority, 2014). The indicative parking requirements for the Proposal are provided in **Table 7.2**.

Table 7.2 Indicative Parking Rates

Use	Yield	Units	Parking Requirement (based on the Provision Rate in the PVAGC)
Houses	20	Houses	40
Apartment (1-bed)	1	Apartments	1
Apartment (2-bed)	150	Apartments	225
Apartment (3-bed)	107	Apartments	214
Townhouses	102	Townhouses	204
		Private Subtotal	**684**
Commercial / Office	1,500	m^2 GFA	38
Food / Beverage	1,740	m2 GFA	174
Fitness & Wellness	2,650	m2 GFA	93
Medical Health Facility	0	N/A	N/A
Specialty Retail	750	m^2 GFA	22
Apartment Visitors	258	Apartments	65
Townhouse Visitors	102	Townhouses	N/A[1]
		Public Subtotal	**392**
		Development Total	**1,076**

[1] *For the Townhouse visitor parking requirements, the current plan allows for visitor parking to be provided internally within the townhouses, as each of these dwellings is proposed to have a 3–4 car garage.*

Table 7.3 Adequacy of Parking Supply

Land Use	Car Park Requirement	Car Park Supply	Difference
Private Parking	684	881	+197
Public Parking	392	321	-71
Total	**1,076**	**1,202**	**+126**

As demonstrated in **Table 7.3**, the Proposal would provide 197 excess parking spaces for residential apartments and townhouses, which is a commercial decision to supply more storage space for cars, bicycles and other uses. The excess storage of the houses and townhouses that is provided by their garages is considered to be acceptable for use by visitors to these dwellings (Calibre Consulting, 2022). These visitors have not been included in the total public parking requirements.

This has been inferred to be consistent with the residential parking objectives of the Parking and Vehicular Access General Code (PVAGC), noting that no issues were identified between these objectives and the CZ6 zone objectives relating to the proposed provision of residential parking within the Yarralumla Brickworks Traffic and Parking Report (AECOM, 2021) (Appendix F08 in **Appendix F**).

However, there are 71 less public parking spaces than the requirement in the PVAGC. Given the temporal nature of parking demand for the public land uses, a temporal parking analysis has been undertaken as shown in **Figure 7.2** below.

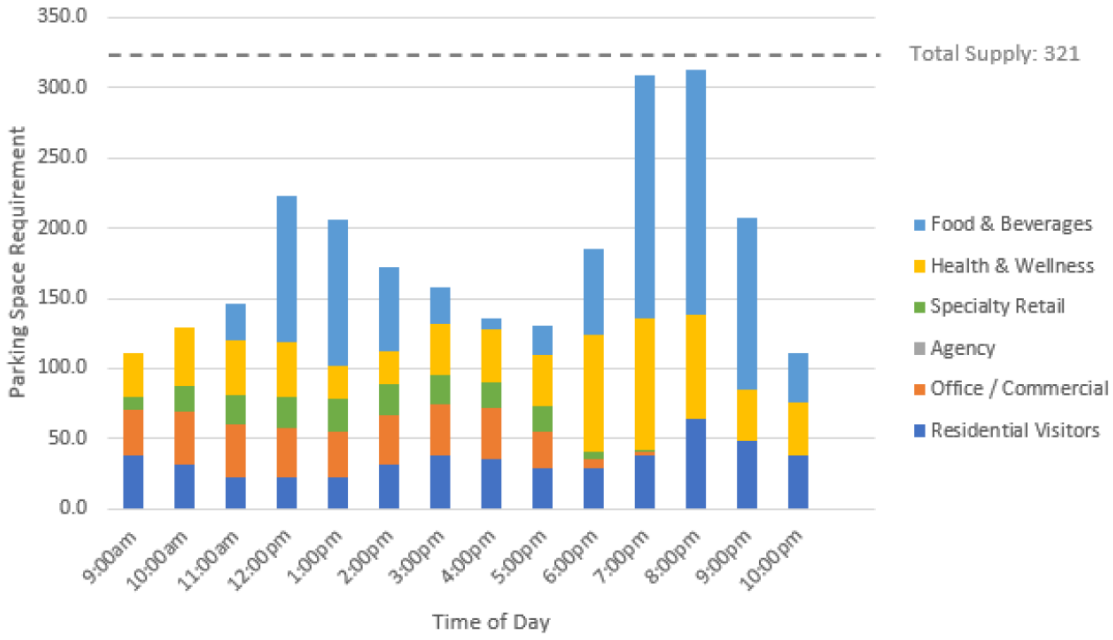


Figure 7.2 Modelled Temporal Profile of Car Parking Supply and Demand for Public Land Uses

Having regard for fluctuations in visitation and car parking demand across the day, it is expected that the Proposal would generate a peak parking demand of 312 parking spaces around 8.00 pm for the site (Calibre Consulting, 2022). According to this modelling, the 321 carparks provided for the public is 9 spaces in excess of the estimated peak demand. As such the proposed minimum of 321 public car parks and 881 private car parks to be provided as part of the Proposal is considered to be consistent with the relevant objectives of the PVAGC. All public and residential car parking is proposed to be either under cover or underground. Parking arrangements for employees at the CBP would be subject to conditions agreed to by businesses operating in the Proposal Area.

Accessible parking needs to be provided in accordance with the PVAGC. The code requires that a minimum of 3% of spaces be provided for people with disabilities. This requirement does not apply to any of the residential parking or visitor parking for houses or townhouses, as these spaces are subject to adaptable housing requirements (Calibre Consulting, 2022). As such, a total of 12 parking spaces are required to be suitable for this use. At present, 10 accessible parking spaces have been included in the Proposal, meaning an additional 2 spaces are required to comply with the PVAGC. As there are expected to be 9 public parking spaces available during peak hour, and standard parking spaces can be converted into accessible parking spaces at a rate of 3:2, it is anticipated that 2 additional accessible parking spaces can be provided while still maintaining suitable parking requirements (Calibre Consulting, 2022).

There is also a requirement to provide motorcycle parking at a rate of 3% with a minimum provision of one motorcycle parking space within a carpark with 30 or more car spaces (Calibre Consulting, 2022). For residential parking, each dwelling has been allowed dedicated parking spaces that could accommodate a car or a motorcycle. As such, no dedicated motorcycle parking is deemed as required in addition to the current proposed parking spaces. For non-residential parking, it is understood that 12 motorcycle parking spaces are required to meet the PVAGC.

The Bicycle Parking General Code (BPGC) for the ACT was used to determine the required supply of bicycle parking spaces. Under the BPGC, at total of 268 private and 44 public bicycle parking spaces are required. As the Proposal is being developed to encourage active travel through the area, the Proponent commits to ensuring additional parking allocations for bicycles over the required amount are provided.

According to the findings of the Yarralumla Brickworks Traffic and Parking Report (AECOM, 2021) (Appendix F08 in **Appendix F**) investigation, the parking for the proposed development will meet the demand for both the private and public land uses. It is noted that the Proposal will need to provide adequate accessible, motorcycle and bicycle parking.

7.4.2.2 Access to Public Transport and Active Travel

The current Masterplan for the CBP incorporates a number of active travel allowances, including shared paths and road crossings throughout the site. Pedestrian facilities include dedicated footpaths on either side of Brickworks Way and within the carriageway for the minor access roads (shared zone arrangement) while the parklands and commercial centre would also be linked via an internal pedestrian path network to encourage active travel, utilising CPTED principles to facilitate public safety (refer to **Section 11.4.3**).

Links to the external pedestrian/cycle network are proposed as follows:

- Link to the informal off-road path (to the south).
- Link to Lane Poole Place (to the north-east).
- Link to Bentham Street (to the north).

As discussed in **Section 7.2.4**, Yarralumla currently has excellent provision of footpaths, and these links would ensure the Proposal is fully integrated with the existing local pedestrian/cycle network minimising the potential for adverse vehicular traffic impacts. These connections would provide a superior outcome to the existing amenity and allow active travel options to key nearby locations including nearby bus stops, Yarralumla Shops, and the Yarralumla Uniting Church. The current proposed path layout within the site can be seen in **Figure 2.6**.

The Proponent was informed by TCCS that no bus services would be provided to the CBP. This was due to existing service arrangements and accessibility within the existing and proposed road network around the Proposal Area.

The location of the nearest bus stops to the site are located along Dudley Street, approximately a 650 m walk from the site. The location of the Dudley Street bus stops was largely prescribed by TCCS and provide stops as close as practical to the new development. The active travel amenities mentioned above connect into these bus stops for ease of access, and pedestrian crossing islands are present along Dudley Street to facilitate pedestrian amenity and safety.

It is noted that the Proposal would not prohibit car sharing services and taxi access into the Proposal Area once operational.

7.4.3 Impacts to Environmental and Heritage Items

The Proponent commits to developing a CEMP that would ensure construction impacts to environment and heritage items would be minimised. The CEMP would be informed by the Conservation Management Plan (GML, 2021a) (Appendix F38 in **Appendix F**), which would assist in demarcating significant heritage items and places within the Proposal Area. Incorporation of the Risk Assessment prepared as part of this EIS will also assist the CEMP in addressing environmental matters holistically and will consider the social and economic dimensions in addition to the environmental.

As further discussed in **Section 16.0** of this EIS, there is limited ecological value to the Proposal Area. While the vulnerable golden sun moth is present, the habitat existing within the site consists of predominantly Chilean needle grass (*Nassella neesiana*), a noxious weed. Retention of this vegetation is not a desirable ecological outcome. As such, the Proponent intends to clear the entire Proposal Area.

Weeds may be introduced to the Proposal Area or exported from the Proposal Area via vehicles and personnel. This would be managed by the CEMP, incorporating measures such as vehicle and personnel sanitisation areas. Refer to **Section 16.0** for further discussion on impacts to ecological matters.

It is noted that heavy vehicles may cause vibration that could impact existing heritage items, particularly components of the core heritage precinct, such as brick stacks. This would also be managed by the Traffic Management Plan within the CEMP. Management measures would include using low RPM for all vehicles within the Proposal Area and staging the access of heavy vehicles onto the site. Heritage areas would be demarcated during the construction of other components of the proposed Masterplan. Potential impacts to heritage items are further discussed in **Section 17.0** of this EIS.

7.5 Proposed Mitigation Measures

A Traffic Management Plan would be prepared as a sub-plan to the CEMP. This would provide detailed management measures to assist in reducing the temporary impacts associated with construction. In addition, general measures that the Proponent commits to include:

- Establishment of no-go zones and fencing prior to construction commencing by implementing an industry best practice CEMP to prevent unauthorised access into adjacent areas.
- Inform EPSDD and DAWE immediately if any impacts outside approved area occur.
- Ensure the Traffic Management Plan includes heavy vehicle access timing during construction and procedures for identifying and responding to impacts to road surfaces.
- Ensure construction teams move trucks carrying excavated material from the Proposal Area to the arterial road network as quickly and efficiently as possible.
- Include construction of Brickworks Way in Stage 1 of construction schedule.
- Ensure the Traffic Management Plan includes an emergency response procedure to be followed in the event of an accident.

- Limit vehicle movement to and from the site where possible via the Traffic Management Plan, in particular limiting truck movements during peak periods and outside of daytime hours.
- Stage truck movements to limit the number of heavy vehicles on the surrounding road network at any one time.
- Engage with nearby residents regarding any planned traffic disruptions.
- Notify surrounding properties of the timing of machinery road access throughout construction.

Further detailed traffic assessments and management plans would be provided at the DA stage and prior to construction, respectively. In addition, general operational commitments for the Proposal with regard to traffic and transport include:

- The provision of 321 public car parks and 881 private car parks, exceeding the anticipated peak parking demand.
- Commit to providing bicycle parking facilities above the quantity required under the BPGC.
- Promote active travel options to residents to reduce the need for vehicle traffic.
- Ensure access points, pedestrian paths and roads are maintained and utilised properly to minimise nuisance to surrounding residents.
- Maintain public parking on site to reduce overflow on-street parking in neighbouring areas.
- Include relevant internal roads and intersections in the ACT road maintenance and upgrade program.
- Private internal roads are to be incorporated into the OEMP to ensure they receive ongoing maintenance.

The application of these management measures against the risks identified in **Section 7.1** and the associated residual risks are outlined in **Section 7.6** below.

7.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
T1	Design Brickworks Way to allow for greater access to the Proposal Area, with minor access roads also available from Bentham Street and Denman Street (completed). Include 321 public car parks and 881 private car parks, exceeding the anticipated peak parking demand.	1-remote	4-major	W	Yes
T2	Provide opportunities for active travel through design (completed). Adequate parking and other transport options to be incorporated into the design of the Proposal (completed). Maintain consultation with the ACT Government to ensure that proposed parking arrangements are suitable according to their policies and land use zoning (ongoing).	1-remote	4-major	W	Yes
T3	Continue consultation with SLA at each stage of detailed design to ensure compatibility (ongoing).	1-remote	4-major	W	Yes
T4	Establish no-go zones for site investigation studies. Inform all contractors of constraints associated with the site and the approval conditions that must be complied with. Ensure contractors implement an environmental management plan for intrusive works on site.	2-unlikely	3-moderate	W	Yes
Construction					
T5	Establish no-go zones, site boundaries, and fences prior to construction commencing by implementing an industry best practice CEMP to prevent unauthorised access into adjacent areas. Inform EPSDD and DAWE immediately if any impacts outside approved area occur.	1-remote	3-moderate	L	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
T6	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan. The plan is to include heavy vehicle access timing during construction and procedures for identifying and responding to impacts to road surfaces. Ensure construction teams move trucks carrying excavated material from the Proposal Area to the arterial road network as quickly and efficiently as possible.	2-unlikely	2-minor	L	Yes
T7	Include construction of Brickworks Way in Stage 1 of construction schedule.	1-remote	2-minor	N	Yes
T8	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan. The plan is to include an emergency response procedure to be followed in the event of an accident. Traffic Management Plan is to limit vehicle movement to and from the site where possible. Limit truck movements during peak periods and outside of daytime hours. Ensure truck movements are staged to limit the number of heavy vehicles on the surrounding road network at any one time.	1-remote	5-catastrophic	M	Yes
T9	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan. Traffic Management Plan is also to limit vehicle movement to and from the site where possible. Engage with nearby residents regarding any planned traffic disruptions. Notify surrounding properties of machinery road access timing throughout construction.	3-possible	3-moderate	M	Yes
Operation					
T10	Promote active travel options to residents to reduce the need for vehicle traffic. Ensure access points, pedestrian paths and roads are maintained and utilised properly to minimise nuisance to surrounding residents. Maintain public parking on site to reduce overflow on-street parking in neighbouring areas.	2-unlikely	4-major	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
T11	Include relevant internal roads and intersections in the ACT road maintenance and upgrade program. Private internal roads are to be incorporated into the OEMP to ensure they receive ongoing maintenance.	4-likely	1-insignificant	W	Yes

It is apparent through the mitigation measures proposed that the environmental risks associated with traffic and transport would be adequately reduced to as low as reasonably practicable.

It is also acknowledged that a medium residual risk of impact relating to increased volumes of construction traffic on local roads and construction of access road connections resulting in traffic disruptions remains. However, this potential impact is considered to be temporary, and would be reduced through the implementation of a Traffic Management Plan and CEMP. All medium to high residual risks are further discussed in **Section 20.0** of this EIS. No significant long-term impacts relating to traffic and transport are anticipated as a result of the Proposal.

8.0 Materials and Waste

Section Summary
This Section addresses materials to be stored on site during construction and wastes predicted to be generated during both the construction and operation phases of the CBP redevelopment. Waste management measures proposed consider the waste hierarchy (avoid, reduce, reuse, recycle) and best practice guidelines. Contaminated wastes, including excavated soils and asbestos material, are discussed in **Section 18.0**.

8.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Construction					
M1	Increased waste to landfill during construction.	4-likely	2-minor	M	No
M2	Construction wastes are not sorted appropriately resulting in target percentages for reuse/recycling not being reached and excess quantities being disposed to landfill.	3-possible	3-moderate	M	No
Operation					
M3	Increased waste to landfill during operation.	4-likely	2-minor	M	No

8.2 Existing Conditions and Values

In its present condition the CBP produces no waste as the site is unused, not operational, and inaccessible to the public.

While many of the existing elements of the Proposal Area would be retained for their heritage values as described in **Section 17.0**, there are many parts of the current CBP that would require removal and subsequent disposal as one of the first phases of the CBP redevelopment.

As introduced in **Section 2.7.1**, redevelopment of the CBP would occur in stages. The initial stage would be focused on remediation, infrastructure and utilities provision, adaptation and repurposing of heritage buildings and the first stage of residential development. Remediation includes demolition, site clean-up, tree removal, storage of reusable material and encapsulation of any hazardous material. The Proposal would seek to minimise waste production, and reuse or recycle wherever possible throughout the construction. This would be done with consideration of the ACT Environment Protection Guidelines. This is further discussed below in **Section 8.4** and **Section 8.5**.

The Tree Management Report (2015) and Tree Assessment Update (2020) prepared by dsb Landscape Architects (refer to Appendix F10 in **Appendix F**) identified that most of the existing trees within the Proposal Area should be removed. Much of the current vegetation on-site is of poor quality (form, structure and health) due to neglect and invasion by weeds and/or pest species or due to suckering/regrowth. As a result, the retention of existing trees may present a hazard to the public due to the risk of falling trees and branches or is inconsistent with prudent bushfire management regimes.

Additionally, there are some trees which require removal to accommodate the proposed development footprint. The majority of trees currently on the CBP have been earmarked for removal, representing a major source of potential waste to be managed during the early stages of construction.

Similarly, there are some elements of the existing site infrastructure which require removal for either safety reasons or due to their low heritage significance and minor contribution to the understanding of the historical industrial operations of the site. Building elements earmarked for removal include ancillary storage buildings and the model railway storage shed. Demolition of these elements would also generate a source of potential waste during the Proposal's initial construction stage.

Site preparation and civil works would include:

- Construction traffic management (access from Dudley Street and construction workers carpark).
- Establishment of bushfire management zones.
- Heritage protection works.
- Service infrastructure upgrades.
- Vegetation management and landscaping.
- The conservation and adaptive use work for key heritage elements including establishment of parks and heritage interpretation.

The second stage of the Proposal would include progressive development of residential precincts in response to market demand and finalising landscaping.

8.3 Investigations

The following reports have been considered with regard to potential materials and waste impacts:

- Preliminary Geotechnical Site Investigation for Canberra Brickworks (SMEC, 2013) prepared for the LDA (refer to Appendix F22 in **Appendix F**).
- Stage 1 Environmental Site Assessment Canberra Brickworks Remediation Project (Robson Environmental, 2015) prepared for Capcorp Constructions Pty Ltd (refer to Appendix F23 in **Appendix F**).
- Canberra Brickworks: Detailed Environmental and Geotechnical Site Investigation (SMEC, 2016a) prepared for the LDA (refer to Appendix F21 in **Appendix F**).
- Yarralumla Brickworks Precinct Tree Assessment: Tree Management Report (dsb Landscape Architects, 2015) prepared for the LDA (refer to Appendix F10 in **Appendix F**).

- Yarralumla Brickworks: Tree Protection Plan (McGregor Coxall, 2021b) prepared for Doma Group (refer to Appendix F11 in **Appendix F**).
- Yarralumla Brickworks Precinct Tree Assessment Update (dsb Landscape Architects, 2020) prepared for Doma and BLOC (refer to Appendix F10 in **Appendix F**).
- Waste Overview: Canberra Brickworks (Sellick, 2021) prepared for Doma (refer to Appendix F45 in **Appendix F**).
- Draft EDP: Environmental Management and Protection Plan (Sellick, 2022c) prepared for Doma (refer to Appendix F24 in **Appendix F**).

As the Proposal is yet to be finalised, it is not appropriate at this stage to quantify projected waste generation, either during construction or operation. However, the Proponent commits to the preparation of a construction waste management plan as a sub-plan to the CEMP; as well as an operational waste management plan as a sub-plan to the OEMP. The two waste management plans would be provided to the EPSDD during the DA stage of the assessment process and would meet the requirements of the ACT Environment Protection Guidelines.

8.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for materials and waste in **Section 8.1** above, the potential impacts of the proposed redevelopment of the CBP relating to materials and waste may be characterised as:

- An increase in the quantity of waste materials produced during both the construction and operation phases of the development, and
- An associated increase in the requirement for landfilling due to poor sorting and/or recycling practices, both during construction and operation.

These potential impacts are analysed in detail below. The additional impacts associated with the excavation and disposal of potentially contaminated soil material during the site remediation works are described in **Section 18.0**.

8.4.1 Increase in Waste Quantities

Precise quantities for anticipated waste generation have not been modelled at this stage. This is because the Proposal remains as a concept for the site, with precise design details to be finalised during the DA stage of assessment.

However, the Proposal would develop and implement both a construction and an operational waste management plan to assist in minimising waste generation and provide strategies for managing any waste generated. This would include waste minimisation procedures to reduce the amount of waste removed from the site. Management, suppliers and contractors would all be encouraged to look at ways to minimise the amount of waste generated, following industry best practice guidelines, including:

- Waste materials would be reduced, reused, and recycled where possible.
- All sewage waste generated during construction would be managed through temporary ablution blocks connected to the existing sewer line. No sewerage pump-out waste is anticipated during construction.
- Residual materials that cannot be reused or recycled would be disposed of at an appropriately licensed waste management facility.

It is expected that impacts associated with increased waste generation during both construction and operation can be managed in accordance with ACT Government requirements.

8.4.1.1 Demolition, Excavation and Construction

The majority of demolition, excavation and construction waste is recyclable and is of higher value when properly separated at source with minimal contamination. This is particularly the case if excavated soils are managed separately, as would be the case at the CBP redevelopment. Due to contamination issues, excavated soils would be classified and managed strictly in accordance with the requirements of the ACT Environment Protection Authority as described in **Section 18.0**. The mitigation measures proposed here apply to all other wastes potentially generated during demolition, excavation and construction.

Separated materials are often cheaper to recycle than to dispose of in landfill therefore separation, reuse and recycling would be maximised throughout the redevelopment of the CBP in order to achieve best practice environmental goals and reduce disposal costs.

During demolition, crews would strip out, salvage, sort and stockpile materials to maximise opportunities for further use on-site or transfer and recycling off-site. It is anticipated that 90% to 95% of all demolition waste would be reused or recycled.

During construction, it is anticipated that 75% to 85% of waste would be recycled or reused. The Proponent would engage a waste contractor to undertake separation off site. Any construction waste that cannot be reused or recycled would be stored in skip bins which would be covered overnight and during windy conditions to prevent material being lost and spread over the site. All waste and recyclable material would be transported by a waste transporter to a waste facility in compliance with the *Waste Management and Resource Recovery Act 2016*.

Documentation on the collection and transport of waste and recycling disposal from demolition, excavation and construction activities would be kept from commencement to completion of work and would be retained for the specified period required by Development Control Code for Best Practice Waste Management in the ACT (ACT Government, 2019d).

An area of asbestos contamination has been identified on-site and its management is discussed separately in **Section 18.0**. Should additional asbestos material be identified on-site during the demolition process, its management, removal and disposal would be undertaken in accordance with the *Work Health and Safety Act 2011* and associated regulations. Similarly, safe handling and removal of hazardous materials such as lead paint or dust from roof cavities would be conducted in line with WorkSafe ACT procedures.

8.4.1.2 Operation

As a mixed-use development, the Proposal would have separate waste management protocols in place for its residential and commercial/retail components, as outlined within the Waste Overview report (Sellick, 2021, and in Appendix F45 of **Appendix F**). The waste and recycling management systems of the residential and commercial/retail components would be stand-alone systems operating independently from each other. These systems would be further developed during the detailed design process.

The Proponent understands that there is an interest in the community for establishing communal compost sites to assist in managing organic waste. The Proposal would not restrict or prohibit the establishment of such communal compost sites, if desired by the Community Trust. The OEMP would aim to facilitate alternative waste management practices within the site, such as compost, recycling and reuse.

8.4.2 Increased Demand for Landfill

Wastes from the construction and operation of the Proposal have the potential to impact on the environment and unmanaged rubbish can impact the amenity of the Proposal Area. The Proposal would develop and implement both a construction and an operational waste management plan to assist in minimising waste generation. This would include waste minimisation procedures to reduce the amount of waste removed from the site. Management, suppliers and contractors would all be encouraged to look at ways to minimise the amount of waste generated, following industry best practice guidelines, as described in **Section 8.4.1** above.

Suitably labelled waste and recycling bins would be placed throughout the Proposal Area once operational. This would allow for collection of waste and recycling generated in each area of the CBP. Garbage and recycling receptacles would be provided in convenient locations around the heritage precinct and Quarry Parklands, where there is potential for higher waste generation by the public.

The Proposal also seeks to minimise the need for waste collection vehicles to traverse through the site. This is to be achieved through the creation of a waste transfer station where residential waste would be transported by the estate manager for collection. Commercial waste from the heritage assets would be transferred to the waste transfer station by commercial tenants, and collected via private waste contractors. The waste transfer station will be designed to meet the requirements of the Development Control Code for Best Practice Waste Management in the ACT.

8.5 Proposed Mitigation Measures and Offsets

Mitigation measures proposed for the CBP redevelopment would be formalised within the proposed construction and operational waste management plans. These would be incorporated into the CEMP and OEMP, respectively. This would ensure that an appropriate level of residential amenity is maintained, and that adequate waste and recycling facilities are provided and capable of being serviced either by Territory-provided collection services or private sector collection services. The OEMP in particular would aim to facilitate alternative waste management practices within the site, such as compost, recycling and reuse.

The Proposal would also ensure that construction activities are undertaken in accordance with EP Act requirements through independent auditing of the site throughout construction. Training would also be implemented for all personnel in waste sorting, with responsibilities designated prior to construction commencing. Key mitigation measures are summarised below:

- Develop and implement industry best practice CEMP prior to construction, which includes a waste management plan. The waste management plan is to consider alternative options to landfill where possible, including recycling and reuse of materials.
- Conduct construction activities in accordance with EP Act requirements and engage independent auditors to confirm compliance.
- Implement training for all personnel in waste sorting and designate responsibilities prior to construction commencing.
- Develop and implement an industry best practice OEMP prior to occupation, including ongoing waste management measures.
- The OEMP is to aim to facilitate alternative waste management practices within the site, such as recycling and reuse.

The application of these mitigation measures against the risks identified in **Section 8.1** and the associated residual risks are demonstrated below in **Section 8.6**.

8.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Construction					
M1	Develop and implement industry best practice CEMP prior to construction, which includes a waste management plan. The waste management plan is to consider alternative options to landfill, including recycling and reuse of materials.	4-likely	1-insignificant	W	Yes
M2	Conduct construction activities in accordance with EP Act requirements and engage independent auditors to confirm compliance. Implement training for all personnel in waste sorting and designate responsibilities prior to construction commencing.	2-unlikely	3-moderate	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Operation					
M3	Develop and implement an industry best practice OEMP prior to occupation, including ongoing waste management measures. The OEMP is to aim to facilitate alternative waste management practices within the site, such as recycling and reuse.	3-possible	2-minor	W	Yes

It is apparent through the mitigation measures proposed that the environmental risks associated with materials and waste would be adequately reduced to as low as reasonably practicable. No significant impacts are anticipated.

9.0 Landscape and Visual

Section Summary
This Section provides an assessment of the likely landscape and visual impacts associated with the Proposal. In particular, it considers impacts associated with vegetation loss and the development of a new precinct.

9.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
V1	Material selection and finishes are not consistent with character of the area or land use zoning resulting in visual impacts.	3-possible	3-moderate	M	No
V2	Insufficient landscaping is included in the final design of the Proposal, resulting in reduced amenity for residents and the public.	2-unlikely	3-moderate	W	No
V3	The design of the Proposal results in significant changes to the existing terrain of the site.	2-unlikely	3-moderate	W	No
Construction					
V4	Vegetation clearing results in a loss of visual amenity for local residents.	3-possible	3-moderate	M	No
V5	Visual impacts of construction on the landscape and to the local community.	4-likely	2-minor	M	No
Operation					
V6	Visual impact of the new precinct on the surrounding landscape.	2-unlikely	3-moderate	W	No

9.2 Existing Conditions and Values

The Proposal Area is well vegetated, particularly around its property boundaries, which provides an effective visual screening for the site. However, the trees within the Proposal Area are generally considered to be in a deteriorating condition.

The predominant species with the site are Monterey pine (*Pinus radiata*), Ponderosa pine (*Pinus ponderosa*), Scots pine (*Pinus sylvestris*) and English elm (*Ulmus procera*), as well as other various tree and shrub weed species. These trees were assessed to be in generally poor condition and present a public safety risk (refer to Appendix F10 in **Appendix F**). The trees are self-sown and most have inherent faults in their structure. Many are also located on steep side slopes of the quarry excavation. Consequently, the views across the Proposal Area are dominated by tall pine trees.

The existing brickworks site is not clearly visible from any publicly accessible location. This is largely the result of the Proposal Area's terrain, with the site containing undulating rises and local relief typically below 10% in natural terrain. The topography of the Proposal Area is variable and has been significantly modified by quarrying and landfill. The Proposal Area ranges in elevation from approximately 570 m Australian Height Datum (AHD) to 590 m AHD, and generally slopes to the west towards the Royal Canberra Golf Club and north-west. A small portion of the Proposal Area, towards Dudley Street, slopes to the south and south-west.

9.3 Investigations

There are no Australian based adopted or agreed guidelines on the assessment of landscape and visual impacts. As such, this section has adopted a qualitative approach, utilising guidance from prominent NSW and ACT Projects and NSW Guidelines, in particular, the Guideline for Landscape Character and Visual Impact Assessment by Transport for NSW (2020).

Key documents utilised for the analysing potential visual and landscape impacts resulting from the Proposal include:

- Yarralumla Brickworks View Impact Studies (Stewart Architecture, 2020) (Appendix F12 in **Appendix F**).
- Uriarra Track View Study (SJB, 2020) (Appendix F44 in **Appendix F**).
- Yarralumla Brickworks Precinct Tree Assessment: Tree Management Report (dsb Landscape Architects, 2015) prepared for the Land Development Agency (Appendix F10 in **Appendix F**).
- Yarralumla Brickworks: Tree Protection Plan (McGregor Coxall, 2021b) prepared for Doma Group (Appendix F11 in **Appendix F**).
- Yarralumla Brickworks Precinct Tree Assessment Update (dsb Landscape Architects, 2020) prepared for Doma and BLOC (Appendix F10 in **Appendix F**).
- Yarralumla Brickworks: Landscape Master Plan (McGregor Coxall, 2021a) prepared for Doma Group (Appendix F46 in **Appendix F**) (DRAFT).

9.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for landscape and visual amenity in **Section 9.1** above, the potential impacts of the proposed redevelopment of the CBP relating to landscape and visual amenity may be characterised as:

- Negative visual impacts of the new precinct on the existing landscape as a result of poor design (including material choices) and/or planning choices.
- Reduced amenity for existing and new residents as a result of insufficient provision of landscaping.
- Negative visual impacts of vegetation removal and changes to the terrain of the locality, during both construction and operation.

These potential impacts are analysed in detail below.

9.4.1 Design/Planning of Development

An indicative landscape program and a Draft Landscape Master Plan have been prepared for the Proposal (McGregor Coxall, 2021a). It is important to note that the details of the proposed landscaping across the CBP remain conceptual and would be assessed further once detailed design is completed at the DA stage. Nonetheless, the indicative program demonstrates the high level of consideration being placed on the landscaping of the Proposal, and the high-quality outcomes being sought.

Table 9.1 Indicative Landscape Program

Name	General Indicative Description
Brickworks Way	Street tree planting with reference to Yarralumla Main Streets, and in accordance with Garden City principles.
Entry Plaza and Brick Gardens	Using reclaimed and crushed bricks found on site from Canberra construction sites, this arrival plaza would aim to celebrate the beauty and richness of the brick product and its process to manufacture and would incorporate seating and interpretive signage hidden in the bricks.
The Village Green	A central open lawn would offer local residents and visitors a sun filled landscape for play, gathering, strolling and meeting. Terraces and potentially stacks of red brick would create a three-dimensional landscape and edge to the lawns. Referring to the historic palettes of manufactured bricks ready to be transported to construction sites around town, these brick stacks would be an iconic piece of landscape that function as a spatial organiser and framing element, as well as an easily identifiable place.
The Rails Playground	Originally the place where bricks were loaded onto rails for transport to Canberra construction sites, the dynamic geometry and topography of mounds and curved tracks would be transformed into a dynamic play park to establish a formal and informal play and exercise landscape for all ages.
The Tracks Fitness Parkour	On the footprint of the old rail tracks, a sport, running and fitness track would link to the Uriarra Track and provide interpretive information on the history of brick making and Canberra construction.
Residential Parklands Community Islands	The apartment buildings are to be surrounded by landscaped areas, providing a colourful and textured matrix into which some activity islands would be inserted. A network of footpaths would connect the apartment buildings with their broader context.

Name	General Indicative Description
The Brickyard	Core element to this square, next to the proposed restaurant and retail pavilions, is possibly an interpretive water element that physically connects the higher level of Pittman Park with the heritage precinct and forms the dramatic end point of an interpretive water story line that starts in Pittman Park. The water feature and landscaping would assist in providing a comfortable microclimate within the yards.
The Reclaimed Gardens	Managed areas of vegetation over concrete where parts of the existing slabs would be removed to give way for trees and low growing ground covers in gravel to provide some natural shade and informal seating. This would be an ideal space to have seating underneath the tree canopies.
The Machineries	Together with a curated community space, this backbone of the precinct would become a working environment amongst the frame of heritage buildings and new landscapes.
The Machinery Kitchen Gardens	This area would provide break out space for the residents and a formal garden displaying the rich palette of pioneering plants, both flowering and scented. A second garden area would be dedicated to the restaurant kitchen, providing fresh herbs and vegetables.
Residential Leisure Gardens	Surrounding the back end around the high chimney, the flat court would be used for tennis, along with an outdoor pool and other sports facilities.
Public BBQ and Picnic Arbours	Benefitting from its elevated location whilst enjoying views over and into the Brickyard, this square would provide the seam between the Brickyard and Pittman Park with BBQ tables, seats and interpretive signage.
Pond Viewing Deck	An elevated deck over the northern edge of the pond would provide long distance views along the cliff cuttings and across the pond. Seating would invite longer stays and quiet reflection on this part of the site.
Bentham Street Access	This access point would provide a direct access into the protected and enclosed picnic and family zones around the pond. This is a secondary access route with the primary access being along the driveway to the east off Bentham Street.
Birds Island	A refuge for wildlife, the remnant island is proposed to be revegetated with native species, providing habitat for wildlife such as frogs and birds.
The Cliff Garden	The northern cliff walls of Pittman Park offer a great opportunity to display and interpret the geology of the site and its fossil findings. A walking path would surround the pond and provide multiple occasions to engage with the cliff gardens.
The Pond	As an integral part of the overall site stormwater management system, the upper levels of the pond would be dedicated to managing runoff while the open pond and vegetation would manage nutrient and pollutant levels and provide wildlife habitat.

The draft Landscape Master Plan (McGregor Coxall, 2021a) (refer to Appendix F46 in **Appendix F**) demonstrates the location and type of trees proposed to be planted for the Proposal. To maintain consistency with the character of Yarralumla, much of the replanting is focused along roads and pedestrian areas. This also seeks to provide natural cooling and shelter for pedestrians and active travellers. Substantial replanting is also proposed throughout the urban parklands within the Proposal.

The proposed species of trees to be planted would be predominantly deciduous, which is also consistent with the surrounding Yarralumla urban landscape. Tree species to be planted and/or retained include:

- *Acacia baileyana*
- *Acer treemanii* 'Jeffersred' Autumn Blaze
- *Angophora floribunda*
- *Betula pendula*
- *Brachychiton populneus*
- *Citrus x sinensis*
- *Eucalyptus gracilis*
- *Eucalyptus mannifera* 'Little Spotty'
- *Eucalyptus radiata*
- *Eucalyptus scoparia*
- *Eucalyptus sideroxylon.*
- *Fraxinus americana*
- *Pyrus calleryana* 'Chanticleer'
- *Quercus palutris*
- *Quercus robur*
- *Tristaniopsis laurina*
- *Ulmus parvifolia* 'Yarralumla Clone'
- *Zelkova serata* 'Green Vase'
- *Fraxinus ornus*
- *Prunus* sp. 'Amanogawa'
- *Pyrus calleryana* 'Capital

The use of deciduous trees would provide appropriate shading through varied seasons within the public realms and parkland areas, as well as further cooling effects to mitigate urban heating and encourage outdoor activity. This is particularly apparent around the Rails Playground, where substantial canopy cover will reduce heating of play equipment and hard surfaces.

In addition, the draft Landscape Master Plan (McGregor Coxall, 2021a) ensures active travel pathways are appropriately covered to provide greater shelter and encourage active travel during varying seasons.

As described in **Section 3.3.8** and **Section 12.4.2**, the draft Landscape Master Plan ensures that the Proposal meets the 30% canopy cover and 30% permeable surface targets outlined within the ACT Climate Change Strategy.

Material selection has not been finalised for the Proposal, however, selections will be made in accordance with the approved Conservation Management Plan, as outlined in **Section 17.0** of this EIS. Material selection would aim to minimise reflection and any significant visual impacts and would be sympathetic to the heritage significance of the CBP.

9.4.2 Visual Impacts

9.4.2.1 Vegetation Removal

As previously mentioned, the general findings of the Tree Assessment Reports prepared by dsb Landscape Architects (2015; 2020) (refer to Appendix F10 in **Appendix F**) indicate that the majority of trees within the Proposal Area are self-seeded and have significantly deteriorated. Consequently, it is proposed to remove the majority of trees existing within the Proposal Area. However, selected trees may be retained where their condition and landscape position do not compromise the aesthetic, safety or sustainability aspects of the Proposal.

Within the Quarry, the trees consist of low-quality pines, dominated by Ponderosa pine (refer to **Photo 9.1**). These trees are known to have a limited lifespan. Some of these pines are positioned above the quarry and around its edges. In combination with their deteriorated condition, these trees are considered to be a safety risk and are recommended for removal.

Photo 9.1 Low quality pines within the Quarry (Umwelt, 2020)

Figure 9.1 outlines the Proposal's Tree Management Plan, identifying which trees are proposed for retention based on the recommendation of dsb Landscape Architects, and which trees require removal to allow for the proposed development. Those trees that are healthy and safe and are not within the development footprint will be retained. Following community feedback, the Proponent also commits to retaining Tree 276. This tree is a Deodar cedar situated at the rear of 17 Schomburgk Street, at the eastern boundary of the Proposal Area, and has been noted as having significance to the local community.

The proposed access path to/from Bentham Street would be relocated to avoid impacting this tree. The finalised Tree Protection Plan will be amended to reflect this, and the finalised Landscape Master Plan will ensure this tree is retained.

The draft Landscape Master Plan (McGregor Coxall, 2021a) (refer to Appendix F46 in **Appendix F**) demonstrates that the Proponent is committed to extensive and considered replanting of a range of tree species throughout the Proposal Area. Not only will the proposed landscaping provide visual screening within the CBP and to surrounding suburban areas, but it will also improve the safety of the Proposal Area for visitors and residents alike and enhance its capacity to support the dispersal of arboreal species through the provision of healthy trees. The draft Landscape Master Plan has adopted the Garden City principles of the surrounding Yarralumla suburb, integrating the existing character of Yarralumla throughout the Proposal Area.

9.4.2.2 Changes to the Existing Terrain

The proposed design allows for the buildings and roads on the site to follow the current topography, respecting the existing terrain and retaining the existing geological features. The only exception to this is in the north-eastern spur of the quarry which would be infilled. The access to this spur is narrow and secluded and it does not produce a desirable CPTED outcome. Infilling it satisfies the Estate Development Code requirement to enhance '*personal safety and perceptions of safety including way finding, passive surveillance and avoidance of entrapment points*.'

Areas of infill will be compacted to ensure stable and safe development can occur. Geotechnical investigations of the Proposal Area have provided detailed analysis of the soil structure (SMEC, 2013; 2016a) and it is considered that the Proposal Area is suitable for development. This is further discussed in **Section 15.4.2** of this EIS.

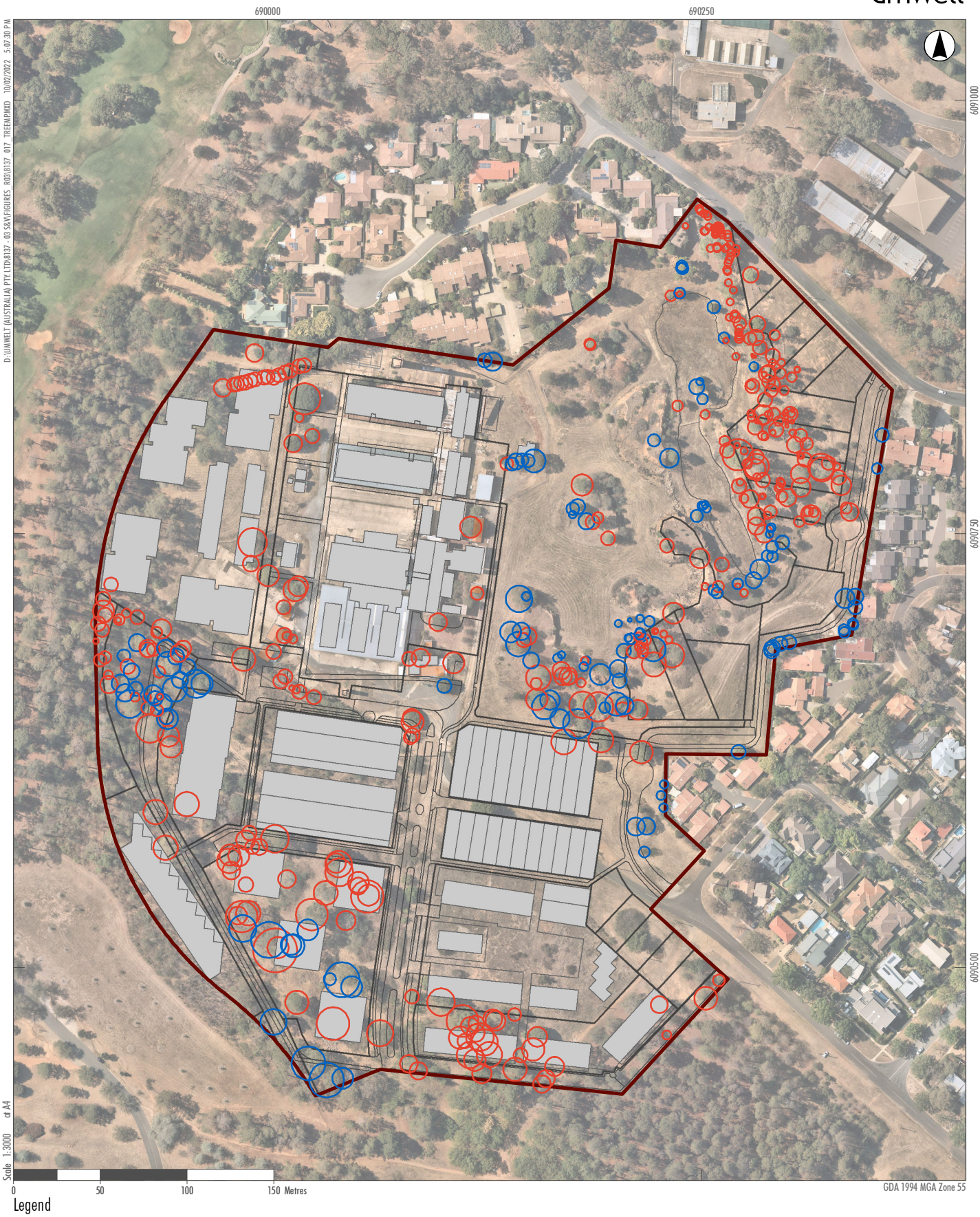
The Proposal is considered unlikely to have a significant impact on the existing terrain of the Proposal Area, and where changes are proposed, this would ultimately improve the safety of the site.

9.4.2.3 Construction Impacts

The Proponent acknowledges that there will be temporary visual impacts associated with construction activities. This would include tree removal, presence of heavy vehicles and machinery and stockpiling. These would be managed through the development and implementation of an industry best practice CEMP, which would include measures such as:

- Provision of fencing and other barricades around the construction site to reduce the visual impacts of construction activities.
- Strategies for managing stockpiles, including water spraying to minimise dust emissions.
- Implementation of a traffic management plan to minimise the timing and frequency of heavy vehicles in local streets as much as practicable.

These construction visual impacts are considered to be temporary.



Legend

Proposal Area

Existing Trees

Tree to be removed due to development footprint

Tree to be considered for retention

FIGURE 9.1

Tree Management Plan

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2020); McGregor Coxall (2021)

9.4.2.4 Visibility of the Proposal

Visibility of the construction component of the Proposal will be low. Laydown areas, stockpiles and site compounds will be strategically located to minimise visual impacts to surrounding areas. In particular, stockpiles will be positioned towards the south-western boundary of the Proposal Area (refer to Appendix F24 in **Appendix F**).

Visibility of the operational component of the Proposal has been modelled within the Yarralumla Brickworks View Impact Studies (Stewart Architecture, 2020), provided within Appendix F12 in **Appendix F**. Seven key viewpoints representing the various typical views from the surrounding area were selected in order to assess the Proposal's impact. All selected viewpoints are located within approximately 1.2 km of the Proposal Area (refer to **Figure 9.2** below). Further assessment of impacts to the Uriarra Track were also undertaken (refer to Appendix F44 in **Appendix F**).

As discussed in **Section 2.8**, a number of reiterations of the Masterplan have been carried out in response to community and government agency feedback. Precinct 7 has since been revised to consist of townhouses, rather than apartment buildings. This will substantially reduce the visibility of Precinct 7 from the south in comparison to previous iterations of the Masterplan. The Proposal also seeks to minimise visual impacts to the south through extensive landscaping and replanting.

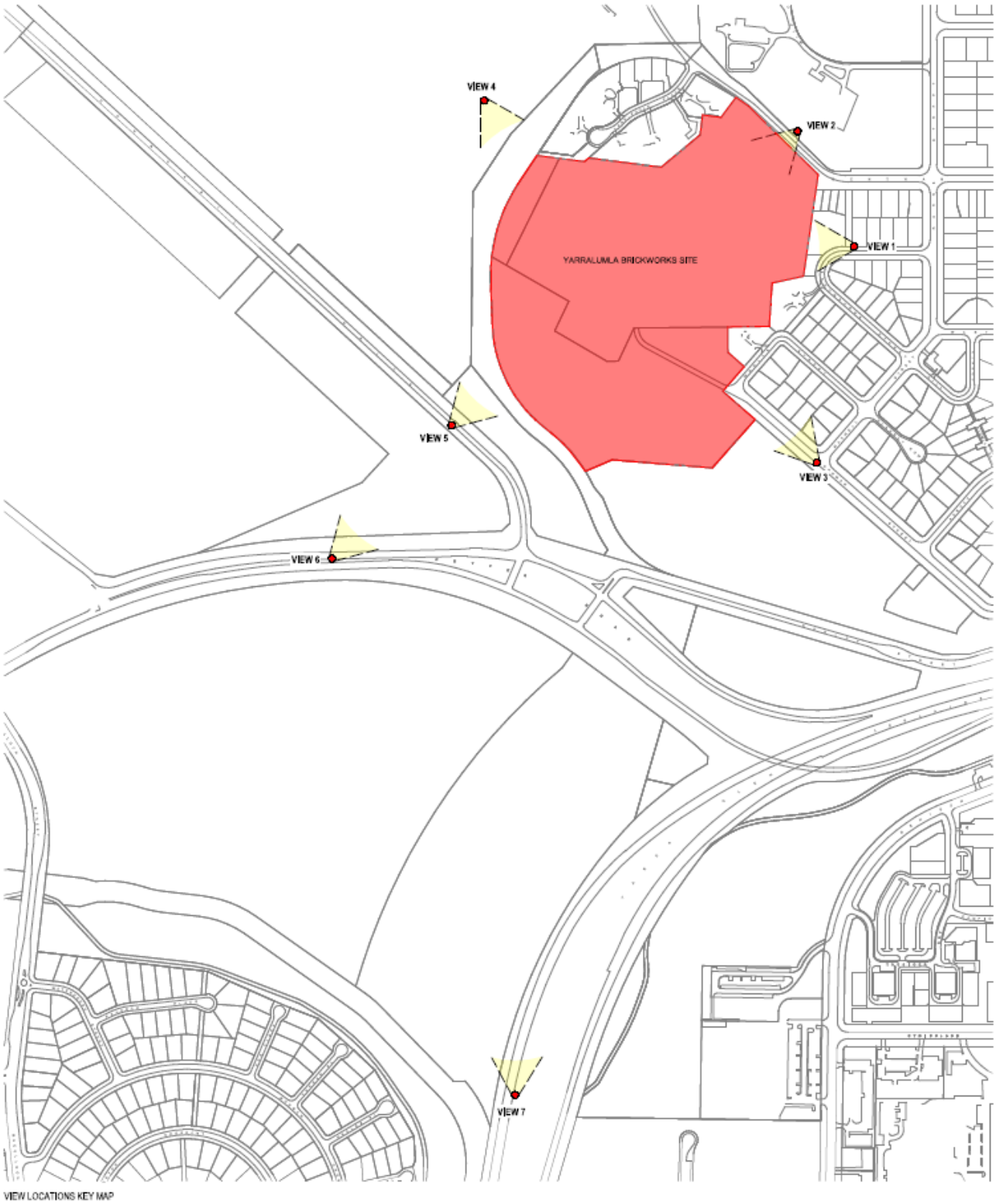


Figure 9.2 Key Visual Impact Viewpoints (Stewart Architecture, 2020)

9.4.2.5 Evaluating Visual Impact

Visual impact has been analysed utilising the landscape character and visual impact rating matrix provided in **Table 9.2** below. This analysis is qualitative in nature only and has been developed with reference to the Guideline for Landscape Character and Visual Impact Assessment by Transport for NSW (2020). An analysis of the View Impact Studies presented by Stewart Architecture (2020) has then been presented in **Table 9.3**. No other viewpoints were considered in this analysis.

It is important to recognise that visual impacts are also determined by the 'journey' experienced by the viewer – this journey is fundamentally different depending on the way in which the viewer is 'using' the area, for example, whether they are driving, riding, walking, or remaining stationary.

For the purpose of this analysis, the following aspects from the key visual impact viewpoints have been considered:

- Location of the Proposal to potential viewers.
- Primary type of viewer, e.g. resident, frequent user, passer-by etc.
- Likely period of viewing.
- Visibility of the Proposal from the seven key viewpoints.
- Physical scale of the Proposal.

Table 9.2 Visual Impact Rating Matrix (refer to the Guideline for Landscape Character and Visual Impact Assessment by Transport for NSW (2020)[9])

		Magnitude			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

The visual sensitivity of the Proposal refers to the importance of the view and how sensitive the view is to any change resulting from the Proposal.

[9] Transport for NSW (2020) Guideline for Landscape Character and Visual Impact Assessment, accessed via: https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/centre-for-urban-design/guideline-landscape-character-and-visual-impact.pdf

Generally, sensitivity is dependent on the type of viewer, composition of the view and the importance of the view. Viewers with the highest sensitivity usually include residents and open space viewers where the view/visual landscape characteristics are highly valued within the community and utilised as scenic lookouts, natural landscape areas etc. Viewers with the lower sensitivities include areas where people are focused on their work or generally where the visual landscape characteristics are not highly valued:

- **High** – viewers consist of residents and regular users of open space areas, where view/visual landscape characteristics are highly valued within the community and frequently utilised by locals and visitors. The landscape is likely to have important features, landmarks, continuity of nature and built features, and/or iconic views. Viewing time is likely to be greater than 2 minutes at any one time and viewed frequently (that is, daily, prolonged viewing). The visual landscape is likely to have intrinsic value to the community.

- **Moderate** – viewers consist of regular users and general community, where the view/visual landscape characteristics are somewhat valued. The landscape may have a moderate level of continuity and uniqueness within the broader landscape and has the ability to accommodate to change without obvious or significant alteration to existing character, or loss/reduction of key elements which define that character. Viewing time may be approximately 1–2 minutes.

- **Low** – viewers are likely to have a low appreciation for the view/visual landscape characteristics, with viewing time less than one minute. The landscape has a low level of continuity and uniqueness within the broader landscape and will accommodate change without obvious or significant alteration to existing character, or loss/reduction of key elements which define that character.

- **Negligible –** viewers are unlikely to notice the view/visual landscape characteristics, with viewing time likely to be transitory (less than 30 secs) in nature. The landscape has no discernible uniqueness within the broader landscape and will accommodate change without any obvious or significant alteration to existing character.

The visual magnitude of the Proposal refers to the physical scale, distinct features, and the contrast it presents to the existing environment. The categories of magnitude for the Proposal have been defined as:

- **High** – total loss of key features or characteristics of the existing landscape and/or introduction of elements considered to be completely uncharacteristic of the existing landscape character.

- **Moderate** – partial loss of key characteristics of the existing landscape and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic of the existing landscape.

- **Low** – minor loss of/or alterations to one or more key characteristics of the existing landscape and/or introduction of elements that are consistent with the existing landscape.

- **Negligible** – very minor alteration to one or more key characteristics and/or introduction of elements that are consistent with the existing landscape.

Table 9.3 Visual Impact Assessment

Viewpoint	Location	Sensitivity	Magnitude	Visual Impact
View 1	Schomburgk Street	High The community will have a high sensitivity to the Proposal due to its visibility from residential properties. This view is likely to experience high viewing times and have intrinsic value to its viewers.	Moderate Minor views of the Proposal from the viewpoint. Dominant viewers include residents on the western section of Schomburgk Street. Proposal is visible from residential properties. The physical scale of the Proposal will partially alter the existing views from the residential properties, due to tree removal and the visibility of the Proposal from their properties.	High-Moderate
View 2	Bentham Street	Negligible The community would have a very low sensitivity to the Proposal from this viewpoint as the main viewers consist of workers at the CSIRO Yarralumla site. Workers generally have a negligible to low sensitivity to visual impacts.	Moderate Full view of part of the Proposal from the viewpoint. View of existing treed area will be partially altered along Bentham Street due to the Proposal's physical scale.	Negligible
View 3	Corner of Denman and Maxwell Street	High The community will have a high sensitivity to the Proposal from this viewpoint due to the prominence and visibility of the site from residential properties.	Low Very minor alterations for residential viewers due to the small physical scale of the Proposal visible from this location.	Moderate
View 4	Fairway view at Royal Canberra Golf Course	Moderate There may be some sensitivity associated with views currently experienced by members of the Royal Canberra Golf Course.	Low Very minor alterations for viewers due to the small physical scale of the Proposal visible from this location. Various trees in the line of sight from this location are proposed to be removed due to their poor condition. These will be replaced as part of the Proposal.	Moderate-Low

Viewpoint	Location	Sensitivity	Magnitude	Visual Impact
View 5	Dunrossil Drive	Negligible The community would have a very low sensitivity to the proposal from this viewpoint as the proposed changes are negligible and viewers would only consist of members of the public frequenting Dunrossil Drive. As this road leads to Government House, it would likely only be visible to the general public during infrequent open day events.	Moderate Minor alterations for viewers due to the small physical scale of the Proposal visible from this location. Various trees in the line of sight from this location are proposed to be removed due to their poor condition. These will be replaced as part of the Proposal.	Moderate-Low
View 6	Cotter Road	Negligible The community would have a very low sensitivity to the Proposal from this viewpoint as the proposed changes are negligible and viewers would consist of members of the public frequenting Cotter Road.	Negligible Very minor alterations for viewers due to the small physical scale of the Proposal visible from this location.	Negligible
View 7	Yarra Glen Drive/ Adelaide Avenue	Low The community would have a low sensitivity to the Proposal from this viewpoint as the proposed changes are negligible and viewers would consist of members of the public transiting along Yarra Glen Drive/Adelaide Avenue.	Negligible Very minor alterations for viewers due to the small physical scale of the Proposal visible from this location.	Negligible

Only View 1 was identified to have works proposed that are deemed to have high-moderate visual impact, due to the presence of residential viewers at this location. While this impact is considered to be high-moderate, in light of the limited number of viewers (residents), the impact of the Proposal from this viewpoint is not significant in the context of the development. Similarly, with Views 3, 4 and 5, which are also considered to have a moderate to moderate-low visual impact, the limited number of residential viewers and users at the Royal Canberra Golf Course and Government House means that the impact is unlikely to be considered significant in the context of the overall development outcomes. All other viewpoints were considered to have a negligible impact due to the lower sensitivities of viewers in these areas, including workers and members of the public frequenting roads and the golf course.

Mitigation of these impacts includes proposed new tree plantings to provide sufficient screening to surrounding residential properties. Details of these mitigation strategies are outlined below.

Overall, it is considered that the Proposal will have minimal visual impacts once operational through implementation of the mitigation measures outlined below.

9.5 Proposed Mitigation Measures

The Proponent has considered the Proposal's potential visual impacts on the surrounding areas through the design process, including:

- Implementing the Garden City principles throughout the design process.
- Designing the Proposal to be sympathetic to the Brickworks Heritage Precinct.
- Careful design and siting of buildings, having consideration for topography and surrounding views.

Any substantial design changes that have the potential to result in additional visual impacts would be further assessed in future development applications.

In addition, key mitigation and management measures proposed for the CBP redevelopment to reduce visual impacts are summarised below:

- Material selection to be made in accordance with the approved CMP (GML, 2021a).
- Materials would be chosen to minimise reflection and any significant visual impacts.
- Design and implement a considered landscape masterplan that seeks to enhance amenity of the Proposal Area.
- Retain Tree 276 to protect local community amenity and history.
- Design the Proposal to maintain the existing terrain as much as possible.
- Develop and implement an industry best practice CEMP which includes stockpile management strategies.
- Locate laydown areas and stockpiles away from sensitive viewers.
- Erect fences and other barricades around construction site during the construction phase.

- Implement a traffic management plan to minimise timing and frequency of heavy vehicles on local streets as much as practicable.
- Develop and implement an industry best practice OEMP prior to occupation, including ongoing landscape management.

The application of these mitigation measures against the risks identified in **Section 9.1** and the associated residual risks are demonstrated below in **Section 9.6**.

9.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
V1	Material selection to be made in accordance with the approved CMP (GML, 2021a). Materials would be chosen to minimise reflection or any significant visual impacts. The design of the Proposal would be sympathetic to the Brickworks Heritage Precinct.	2-unlikely	3-moderate	W	Yes
V2	Design and implement a considered landscape master plan that seeks to enhance amenity of the Proposal Area. Implement Garden City principles throughout the design process. Retain Tree 276 to protect local community amenity and history.	2-unlikely	2-minor	L	Yes
V3	Design the Proposal to maintain the existing terrain as much as possible.	2-unlikely	2-minor	L	Yes
Construction					
V4	Implement a considered landscape master plan that seeks to enhance amenity of the Proposal Area.	2-unlikely	3-moderate	W	Yes
V5	Develop and implement industry best practice CEMP which includes stockpile management strategies. Locate laydown areas and stockpiles away from sensitive viewers. Erect fences and other barricades around construction site such that they reduce the visual impacts of the construction phase. Implementation of a traffic management plan to minimise timing and frequency of heavy vehicles on local streets as much as practicable.	4-likely	1-insignificant	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Operation					
V6	Careful design and siting of buildings, having consideration for topography and surrounding views. Develop and implement an industry best practice OEMP prior to occupation, including ongoing landscape management.	1-remote	3-moderate	L	Yes

It is apparent that through appropriate management measures, impacts to visual amenity will be minimised. The Proposal is expected to improve the landscaping of the Proposal Area, with existing degraded vegetation to be removed and the site revitalised through new plantings and design. No significant impact is expected.

10.0 Water Quality and Hydrology

Section Summary
This Section provides an assessment of potential impacts to water quality and hydrology within the CBP as a result of the Proposal. This assessment includes consideration of both surface water and groundwater, and includes MUSIC modelling and consideration of impacts relating to sedimentation and erosion and overland flow.

10.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
W1	Proposed mitigation measures (e.g. Water Sensitive Urban Design (WSUD)) are not designed to adequately mitigate indirect impacts into nearby Lake Burley Griffin or urban storm water systems, resulting in unanticipated impacts to MNES, aquatic flora and fauna and local residences through increased water flows and decreased water quality.	3-possible	3-moderate	M	No
W2	Mobilisation of existing groundwater contamination through ineffective design or management of hydrology and water management infrastructure.	2-unlikely	4-major	M	No
Construction					
W3	Construction activities change water regimes including flow rate, quality, sedimentation, and erosion, resulting in environmental impacts beyond the approved development area.	3-possible	3-moderate	M	No
W4	Bioremediation failure results in leaching of contaminants into groundwater.	2-unlikely	4-major	M	No
Operation					
W5	Increased run off from impervious surfaces, such as car parks, increases flow downstream.	3-possible	3-moderate	M	No
W6	Inadequate water flows and water treatment result in reduced water quality, impacting aquatic flora and fauna, landscaping and local residents.	3-possible	3-moderate	M	No

10.2 Existing Conditions and Values

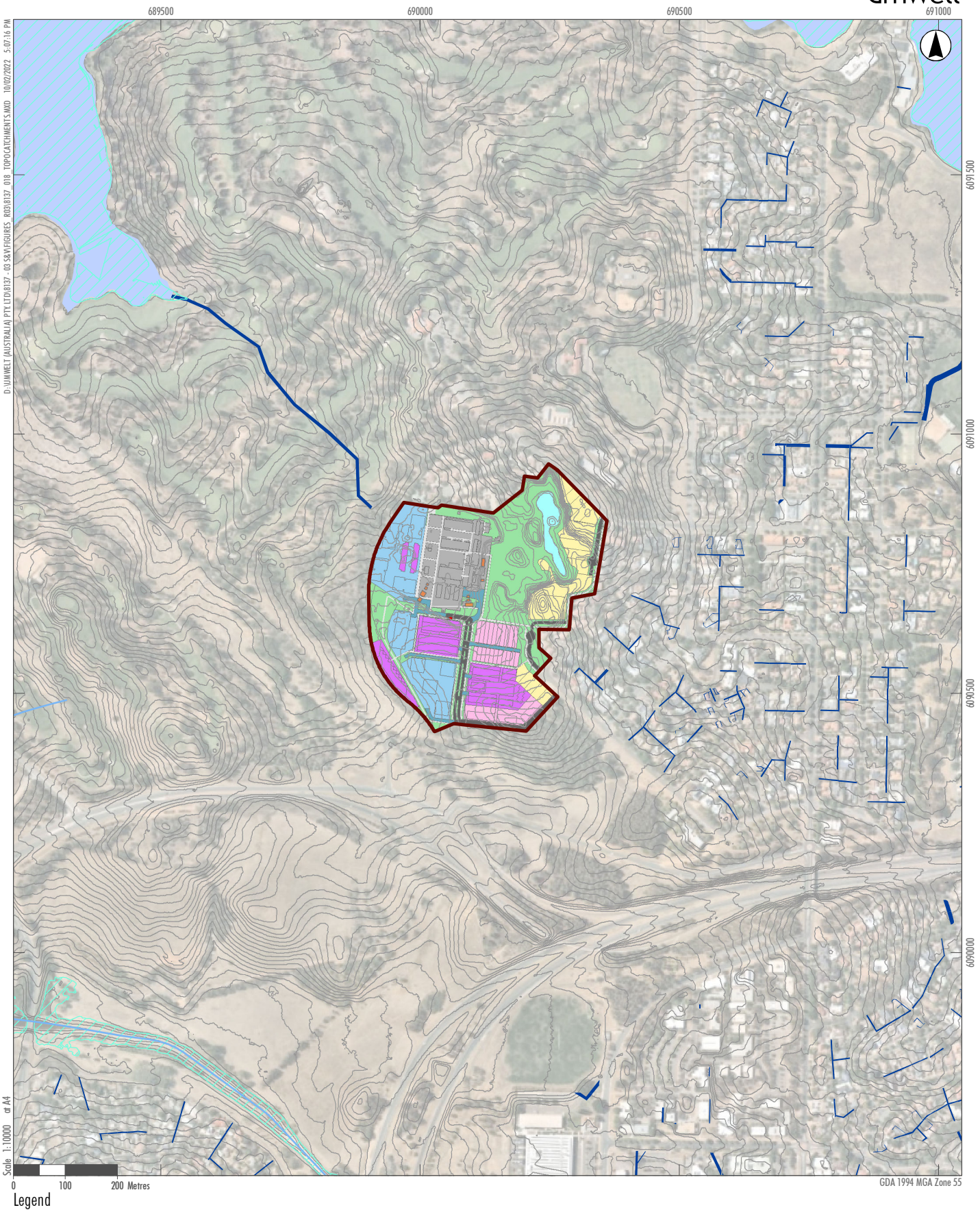
There are no watercourses within the CBP; the nearest surface water body being Warrina Inlet of Lake Burley Griffin, approximately 600 m to the north-west of the Proposal Area (refer to **Figure 10.1**). However, the quarry pit can act as an ephemeral water body (refer to **Photo 10.1**).

Surface water flow has been significantly modified by the historic use of the site, especially relating to the quarry use and fill. The main catchment in the Proposal Area encompasses the brickworks, quarry, former workers accommodation and cleared land off Denman Street. Surface water runoff from this catchment drains to the north-west corner then via a drainage reserve through the Royal Canberra Golf Club into the Warrina Inlet of Lake Burley Griffin. The drainage reserve includes both piped infrastructure and overland flow path.

Surface water sampling from the quarry was undertaken by SMEC (2016b) (Appendix F15 in **Appendix F**). Results indicated that zinc was present in quantities that exceeded the National Environment Protection Measure (NEPM) (2013) screening criteria for fresh water. This is believed to be of natural origin but may be associated with the historic use of the site as a brickwork. All other metals and contaminants were below detection limits or below assessment criteria. This is considered unlikely to represent a significant health or environmental risk and is further discussed in **Section 18.0** of this EIS.

The Proposal Area demonstrates variable groundwater depths, which may be due to the underlying geology and history of site disturbance and excavation. Groundwater investigations have been carried out by SMEC (2016b) (Appendix F15 in **Appendix F**) and subject to a technical review (Arcadis, 2017) (Appendix F42 in **Appendix F**). Concentrations of heavy metals identified within the groundwater across the site do not represent a significant environmental risk (Arcadis, 2017). Benzene was identified above Laboratory Limits of Reporting (LORs) from samples; however, these were below the adopted Groundwater Acceptance Criteria (GAC) for the site (Arcadis, 2017). This was also not considered to represent a significant health or environmental risk (Arcadis, 2017).

Photo 10.1 Ephemeral Water Body Within the Existing Quarry (Umwelt, 2020)



Legend

- Proposal Area
- Apartment Typology
- Heritage Precinct
- Single Dwelling Block with Community Title Scheme
- Single Dwelling Lots
- Terrace Typology
- Open Space
- Water
- Community Title Road / Driveway
- Public Carpark Entry
- Public Roads
- Shared/Footpath
- Structures to be Demolished
- Contours (1m)
- Watercourses
- 1 in 100 Year Flood
- Water Body
- Stormwater Drainage

FIGURE 10.1

Topography and Catchments

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory

10.3 Investigations

A number of investigations have been undertaken relating to water quality and hydrology. The assessment provided in this EIS has considered the following reports:

- Canberra Brickworks: Groundwater Investigation – Addendum Report (SMEC, 2016b) (Appendix F15 in **Appendix F**) prepared for the Land Development Agency.
- Final Concept Pond Design: Yarralumla Brickworks, Canberra (Alluvium, 2016) (Appendix F13 in **Appendix F**) prepared for BLOC.
- Yarralumla Brickworks stormwater treatment systems (Alluvium, 2022) (Appendix F14 in **Appendix F**) prepared for Doma.

Alluvium (2016; 2022) (Appendices F13 and F14 in **Appendix F**) developed a MUSIC model to determine urban design flow volumes and treatment requirements following urban development.

It is noted that Alluvium (2022) has also provided a high-level estimate of fractional imperviousness based on the draft Landscape Master Plan (McGregor Coxall, 2021a). This would be refined at the final design stages and would be consistent with the final Estate Development Stormwater Plan, to be prepared as part of the Estate Development Plan (EDP) development application.

10.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for water quality and hydrology in **Section 10.1** above, the potential impacts of the proposed redevelopment of the CBP relating to water quality and hydrology may be characterised as:

- Increased surface water runoff due to an increase in the area of impervious surfaces across the redeveloped site.
- Inadequate water flows resulting in reduced water quality and impacts to vegetation and local residents.
- Inadequate water treatment, resulting in decreased water quality into nearby Lake Burley Griffin and urban stormwater systems.
- Mobilisation of contamination into groundwater through ineffective design or management, or bioremediation failure.

These potential impacts are analysed in detail below. The additional potential water impacts associated with the management of potentially contaminated soil material during the site remediation works are described in **Section 18.0**.

10.4.1 Water Quantity

In the absence of sufficient flow in the proposed quarry pond, nutrients and sediments entering the system could lead to an increased risk of algal blooms. This increased pollutant load discharging from the Proposal Area may have serious implications on downstream receiving waters, such as Lake Burley Griffin. It is therefore essential to understand and manage the pond residence time and turnover. According to the Stormwater Treatment Systems report (Alluvium, 2022), pond residence time and turnover targets are:

- Sufficient inflow to ensure there is a summer residence time (turn-over of water) of less than 50 days so as to avoid stagnant water and algal blooms, and
- Sufficient inflow to ensure a 20th percentile annual residence time of between 20 and 30 days.

The stormwater quantity targets for the Proposal are based on following two principles outlined in the WSUD General Code (2016):

- On-site Retention (OSR) of flows – 1.4 kL per 100 m^2 of impervious hard surface.
- On-site Detention (OSD) of flows – 1 kL per 100 m^2 of impervious hard surface.

Water flow within the Proposal Area would be managed through a series of water treatment assets. Alluvium (2022) has designed the proposed water treatment assets with consideration to these principles and aforementioned turnover targets. The proposed water treatment assets would include:

- Conversion of the existing quarry pond to accommodate a sediment basin, constructed wetland and pond.
- Diversion of flows from catchment G (proposed single dwellings positioned above the quarry) to the treatment assets via a gravity fed stormwater pipe between lots 10 and 11.
- Diversion of additional runoff from the western developed surfaces to the low point near the north-west boundary and subsequent pumping to the treatment assets.
- Bypassing of high flows to an on-site detention tank, the size of which will be refined at a later stage, to retard peak flows.
- Storage of treated stormwater from the pond in an on-site retention tank for landscape irrigation purposes.
- Installation of a 200 kL rainwater tank in catchment D for open space irrigation.

The advanced draft design of these treatment assets is demonstrated in **Figure 10.2** below.

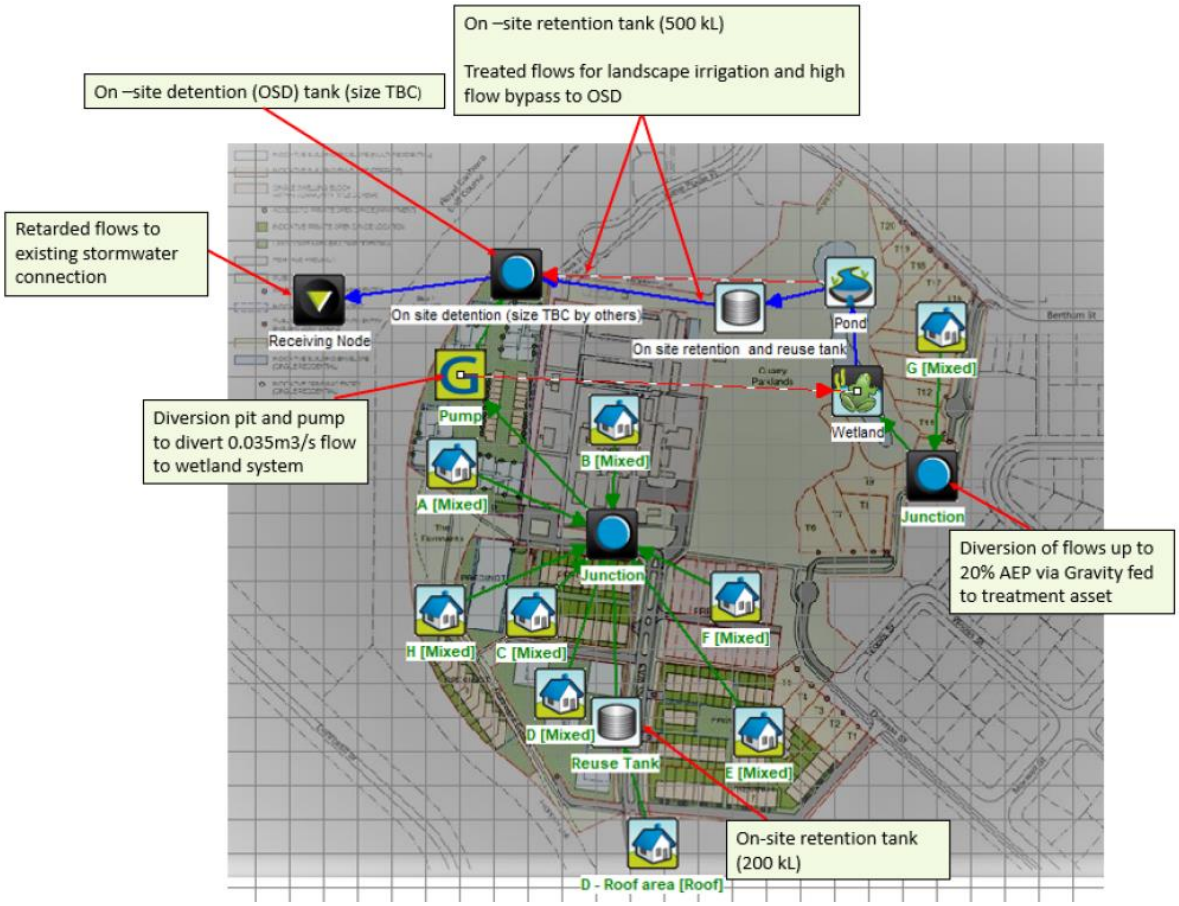


Figure 10.2 Advanced Draft Design of Treatment Assets

© Alluvium, 2022.

The stormwater treatment systems report (Alluvium, 2022) recommends a diversion rate of 0.1 m^3/s to the sediment basin/wetland/pond treatment system from the low point on the development to ensure:

- Adequate pollutant reduction for the entire development.
- Sufficient turnover in the pond.
- 80–85% reliability of irrigation demand from the open space surrounding the pond through a 500 kL tank.
- Reliability of inflows to system.

Flows up to five-year ARIs/AEP 20% from the single dwelling catchment would be diverted to the pond treatment system via gravity feed. However, due to the site's topography, the strategy also relies on the efficient working of a pump installed at the stormwater collection point. In case of pump failure, stormwater will be stored in the on-site detention tank, which prevents any erosion and/or pollution threat to the downstream stormwater network.

The stormwater pump would be located to the north of the Proposal Area (refer to Appendix C of the stormwater treatment systems report (Alluvium, 2022; refer to Appendix F14 in **Appendix F**). The pump would be easily accessible for maintenance and preferably located on community title land.

The size of the on-site retention tank would be refined during final detailed design, in consultation with civil engineers, to retain and retard peak flows to predevelopment levels. The stormwater treatment systems report (Alluvium, 2022; refer to Appendix F14 in **Appendix F**) has recommended a 500 kL retention tank for receiving treated flows from the pond to supply water for irrigation purposes (in the green space surrounding the pond), which would have an 80–85% reliability.

As aforementioned, the post-development flows will be retarded back to pre-development condition using an on-site detention tank (Alluvium, 2022). The sizing and arrangement of this would be determined in the detailed design stage. As such, it is considered unlikely that the Proposal would result in adverse impacts to Lake Burley Griffin or urban stormwater systems.

The Proponent will undertake detailed hydrological modelling during the DA stage of the Proposal in order to assess peak flows, peak storage levels and critical durations for sizing detention storage more accurately.

The reuse of harvested stormwater for toilet flushing was investigated, however, there are insufficient flows to make this feasible (i.e., very low reliability of meeting the larger demand). As unreliable sanitation would present a potential health risk to residents, it was determined that the Proposal would only provide recycled water connection to gardens and green spaces.

A detailed surface water management strategy would also be prepared prior to construction. This would seek to provide further assessment and management measures for on-site stormwater retention and detention and provide water stability and flood management for downstream receiving environments. In particular, the strategy would consider the impacts and management strategies for low water flows. In light of the topography of the Proposal Area, potential impacts relating to climate change, and the absence of any significant water bodies, it is considered that the risk of low water flow is higher than that of flooding throughout the Proposal Area. As such, the Proposal will seek to retain stormwater wherever possible to ensure that the proposed landscaping is sufficiently irrigated.

10.4.2 Water Quality

The Proposal would manage water quality and flow through a series of water treatment assets, as outlined above in **Section 10.4.1**.

A MUSIC model was developed to investigate the impact of pollutant load generation as a result of the Proposal (i.e. due to increased impervious areas) (Alluvium, 2016; 2022) (refer to **Figure 10.3** and (Appendices F13 and F14 in **Appendix F**).

The ACT Practice Guidelines for WSUD (2016) were used to develop water quality treatment targets for the development site. The reduction targets are:

- Gross pollutants by at least 90% of the mean annual load.
- Total Suspended Solids (TSS) by at least 60% of the mean annual load.
- Total Phosphorous (TP) by at least 45% of the mean annual load.
- Total Nitrogen (TN) by at least 40% of the mean annual load.

The assessment parameters for the proposed indicative pond, wetland and sediment basin treatments are outlined in **Table 10.1** below.

Table 10.1 Indicative Treatment Asset Parameters

Measure	Pond	Wetland	Sediment Basin
Treatment area (NWL), m^2	1500	1050	250
Average depth, m	1	0.4	1.0
Volume, m^3	1500	420	250
Extended detention, m	0.35	0.35	0.35
Freeboard, m	0.3	0.3	0.3
Extended detention time (hours)	-	72	-

Based on the above information, it is apparent that the Proposal would not require a Regulatory Plan or Service Operating Certificate as required by the *Utilities (Technical Regulation) Act 2014***.** However, the proposed stormwater reuse scheme would seek endorsement from TCCS, as required under 17.1 (Rule 123) of the Estate Development Code.

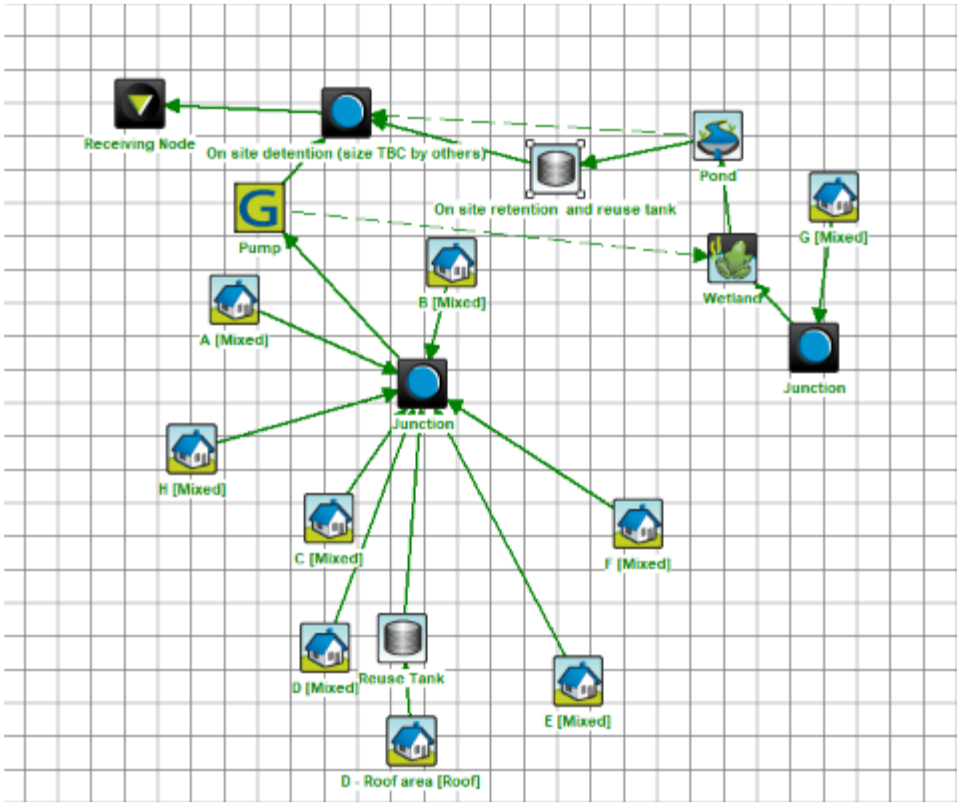


Figure 10.3 MUSIC Model of Treatment Approach

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The overall treatment train result for the above scenario modelled in MUSIC is shown in **Table 10.2** below.

Table 10.2 Indicative Treatment Train Results

Pollutant	Source load	Residual load	% reduction	% reduction target
Gross pollutants (kg/yr)	1710	171	90	90
Suspended solids (kg/yr)	10,700	1,920	82	60
Total phosphorous (kg/yr)	9.94	3.87	60.1	45
Total nitrogen (kg/yr)	131	36	72.5	40

According to the stormwater treatment systems report (Alluvium, 2022; refer to Appendix F14 in **Appendix F**), the proposed sediment basin, wetland and pond (including the irrigation reuse throughout the catchment) meet the overall development's stormwater treatment requirements for TSS, TP and TN at the proposed diversion rate. A litter trap would be installed at the pumping location to increase the Gross Pollutant reduction rate in order to meet the target. Nonetheless, the sediment basin, wetland and pond treatment system in combination with tanks for on-site stormwater reuse are considered to provide the required pollutant reduction for the development (Alluvium, 2022; refer to Appendix F14 in **Appendix F**).

The presented strategy (Alluvium, 2022; refer to Appendix F14 in **Appendix F**) is the preferred approach at the site due to its significant reduction in pollutants, high reliability for meeting landscape irrigation demands, and low risk of deterioration of pond water quality due to algal blooms (i.e., reliable inflows to the pond).

10.4.3 Groundwater

It is acknowledged that bioremediation treatment assets, such as those proposed for the treatment of stormwater at the CBP, can fail for a range of reasons. These include geotechnical conditions, poor design, and failure to adequately maintain an asset. The Proposal is considered to have sufficiently reduced the risks associated with geotechnical conditions and poor design, having undertaken detailed investigations for the Proposal.

The proposed treatment assets have been designed in accordance with WSUD Principles. The proposed stormwater treatment assets would also be maintained regularly through a detailed OEMP to ensure no interaction with groundwater. Groundwater monitoring is proposed to be undertaken throughout construction in accordance with the Sampling, Analysis and Quality Plan (SAQP) (Appendix F42 in **Appendix F** and **Section 18.0**).

10.5 Proposed Mitigation Measures

Mitigation measures for the Proposal would be formalised within a CEMP and OEMP. A detailed surface water management strategy would also be prepared prior to construction.

On-site retention tank design would be refined during detailed design and would be accompanied by a surface water management strategy.

The proposed treatment assets are considered appropriate and sufficient for managing water quality and quantity within the Proposal Area. The treatments would be designed in accordance with the recommendations outlined within the Final Concept Pond Design (Alluvium, 2016) (Appendix F13 in **Appendix F**).

The proposed water quality treatment strategy proposed by Alluvium (2022) (Appendix F14 in **Appendix F**) will be adopted for the Proposal, including the strategies detailed in **Section 10.4.2** above.

In addition, the following management measures are proposed in order to minimise water impacts:

- Conduct a Safety in Design assessment for all designs to identify risks associated with the construction, operation, and maintenance of an asset. This includes risks to works, community and those that would be maintaining the system, as well as risks to the environment.
- Design would meet the requirements of the WSUD General Code (EPSDD, 2020) to ensure post-development flows do not exceed pre-development flows.
- All design teams and projects would endeavour to consult with those who would ultimately be maintaining the system, in order to identify required changes to designs so that the assets continue to function appropriately.
- Undertake detailed hydrological modelling during the DA stage of the Proposal in order to assess peak flows, peak storage levels and critical durations for sizing detention storage.
- Seek endorsement of the proposed stormwater reuse scheme from TCCS.
- Develop and implement CEMP that includes and implements management plans to avoid or minimise environmental risks.
- Prepare a detailed surface water management strategy prior to construction.
- Install a litter trap at the pumping location to increase the Gross Pollutant reduction rate.
- Ongoing management of all stormwater management assets would be incorporated into the OEMP.
- WSUD infrastructure would be maintained to standards set out in the WSUD General Code.
- Monitor groundwater quality throughout construction and operation of the Proposal by implementing the Sampling, Analysis and Quality Plan (SAQP), with monitoring to be undertaken at regular intervals (e.g. biannually).

In addition, the Proponent would be undertaking remediation of the Proposal Area to meet the requirements of the EPA. Groundwater monitoring is proposed through the implementation of a Sampling, Analysis and Quality Plan (SAQP). It is considered unlikely that any groundwater contamination would be mobilised as a result of the Proposal. Refer to **Section 18.0** for further discussion on potential contamination impacts.

The application of these management measures against the risks identified in **Section 10.1** and their associated residual risks are outlined below in **Section 10.6**.

10.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
W1	Implement the water quality treatment strategy proposed by Alluvium (2022). Conduct a Safety in Design assessment for all designs to identify risks associated with the construction, operation and maintenance of an asset. Design would meet the requirements of the WSUD General Code to ensure post-development flows do not exceed pre-development flows. Undertake detailed hydrological modelling during the DA stage of the Proposal in order to assess peak flows, peak storage levels and critical durations for sizing detention storage. Seek endorsement of the proposed stormwater reuse scheme from TCCS. Install a litter trap at the pumping location to increase the Gross Pollutant reduction rate.	2-unlikely	3-moderate	W	Yes
W2	Undertake remediation work in accordance with the SAQP, RWP and SMP, in accordance with the requirements of the EPA. Monitor groundwater quality throughout construction and operation of the Proposal by implementing the SAQP, with monitoring to be undertaken at regular intervals (e.g. biannually).	1-remote	4-major	W	Yes
Construction					
W3	Develop and implement industry best practice CEMP that includes and implements management plans to avoid or minimise environmental risks. Prepare a detailed surface water management strategy prior to construction.	2-unlikely	3-moderate	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
W4	A Safety in Design assessment is conducted for all designs to identify risks associated with the construction, operation, and maintenance of an asset. This includes risks to works, community and those that would be maintaining the system, as well as risks to the environment. All design teams and projects should endeavour to consult with those who would ultimately be maintaining the system, in order to identify required changes to designs so that the assets continue to function appropriately.	1-remote	4-major	W	Yes
Operation					
W5	Implement the water quality treatment strategy proposed by Alluvium (2022). Design would meet the requirements of the WSUD General Code (EPSDD, 2020) to ensure post-development flows do not exceed pre-development flows. Ongoing management of all stormwater management assets would be incorporated into the OEMP. WSUD infrastructure would be maintained to standards set out in the WSUD General Code. Monitor groundwater quality throughout construction and operation of the Proposal by implementing the SAQP, with monitoring to be undertaken at regular intervals (e.g. biannually).	2-unlikely	3-moderate	W	Yes
W6	Implement the water quality treatment strategy proposed by Alluvium (2022). Undertake detailed hydrological modelling during the DA stage of the Proposal in order to assess peak flows, peak storage levels and critical durations for sizing detention storage. Prepare a detailed surface water management strategy prior to construction.	2-unlikely	3-moderate	W	Yes

It is apparent through the mitigation measures proposed that the environmental risks associated with water quality and hydrology can be adequately managed. No significant impacts are anticipated.

11.0 Socio-Economic, Health and Recreation

Section Summary
This Section addresses the potential changes to the amenity of surrounding areas as a result of the Proposal and potential impacts on existing site neighbours. The main issues of concern were identified as public safety, traffic and access, Masterplan design and environmental amenity including dust, noise and light pollution. Risks associated with contamination were also identified but are discussed separately in **Section 18.0**.

11.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
S1	Design does not reflect the character of the surrounding suburb, resulting in community concern.	2-unlikely	4-major	M	No
S2	Inadequate attention to design and layout results in a lack of passive surveillance.	2-unlikely	3-moderate	W	No
S3	Design does not include adequate accessibility to urban parklands, resulting in reduced amenity of the area and the Proposal.	2-unlikely	2-minor	L	Yes
Construction					
S4	Construction activities cause a loss of residential amenity through dust, noise and lighting impacts.	3-possible	3-moderate	M	No
Operation					
S5	Intensification of the use of the precinct causes a loss of residential amenity.	2-unlikely	2-minor	L	Yes
S6	Inadequate existing social services within the area to support an increase in population as a result of the Proposal.	3-possible	3-moderate	M	No

11.2 Existing Conditions and Values

The CBP is situated towards the south-western boundary of the suburb of Yarralumla in Canberra. As previously described, the following land uses immediately border the Proposal Area:

- Medium and low density residential to the north.
- Low density residential to the east.
- Open space to the south.
- The Royal Canberra Golf Club, which forms part of the Westbourne Woods, to the west.

The suburb of Yarralumla is located in the central Canberra district of South Canberra and is bordered by Lake Burley Griffin to the north, Commonwealth Avenue and Capital Hill to the east, Adelaide Avenue and the Cotter Road to the south, and Scrivener Dam, Lady Denman Drive and part of the Molonglo River to the west. The suburb covers an area of approximately 8.8 km^2, more than half of which consists of open space or non-residential development, including Weston and Stirling Parks, the Royal Canberra Golf Club, and the grounds of Government House. A number of houses within the suburb are also occupied by diplomatic missions.

According to the 2016 Census (ABS, 2016), Yarralumla has a population of 2,890 people, with the average number of people per household being 2.4. The residents have a high weekly median household income of $2,579, in comparison to the rest of the ACT and Australia more broadly. Children aged 0–14 make up 14.3% of the population, while people aged 65 years and over make up 26.4% of the population.

An approximate population yield of between 960–1,300 people is anticipated for the Proposal, subject to occupancy rates.

There are a number of community and recreational facilities available throughout the suburb, including:

- Weston Park, to the north of the Proposal, on Weston Park Road.
- Forestry Oval to the north of the Proposal, on Wilf Crane Crescent.
- St Nicholas Greek-Australian Pre School and Child Care Centre, to the south-east of the Proposal on Hill Corner.
- Yarralumla Uniting Church to the south of the Proposal on Denman Street.
- Aeon Academy, an outside school hour education and care centre located to the west of the Proposal, on Loftus Street.
- Royal Canberra Golf Club to the north of the Proposal on Bentham Street.
- Yarralumla Tennis Club to the west of the Proposal on Mueller Street.
- Lake Burley-Griffin.

Nearby local shops can be found at Yarralumla, Deakin and Curtin.

Further to the north on Lake Burley Griffin there are also a number of local clubs and organisations, including Canberra Rowing Club, Lake Burley Griffin Sea Scout Group and YMCA Canberra Sailing Club.

The CBP itself remains vacant and unused. Evidence of trespass, vandalism and other undesirable social behaviour has been apparent during site inspections of the vacant brickworks' buildings. The ACT Government has since sought to restrict access to the Proposal Area through provision of fencing and security monitoring.

11.3 Investigations

This Section has incorporated a number of specialist studies and considered 2016 Census information and ACT Policy, as discussed in **Section 3.3**. In addition, this assessment has provided a qualitative assessment of the Proposal with consideration to potential socio-economic, health and recreation impacts.

Key investigations considered in this Section include:

- Yarralumla Brickworks View Impact Studies (Stewart Architecture, 2020) (Appendix F12 in **Appendix F**).
- Canberra Brickworks Noise Impact Assessment (Umwelt, 2021a) (Appendix F19 in **Appendix F**) prepared for Doma.
- Yarralumla Brickworks Precinct Tree Assessment: Tree Management Report (dsb Landscape Architects, 2015) (Appendix F10 in **Appendix F**) prepared for the Land Development Agency.
- Yarralumla Brickworks: Tree Protection Plan (McGregor Coxall, 2021b) (Appendix F11 in **Appendix F**) prepared for Doma Group.
- Yarralumla Brickworks Precinct Tree Assessment Update (dsb Landscape Architects, 2020) (Appendix F10 in **Appendix F**) prepared for Doma and BLOC.
- Canberra Brickworks and Environs Community Needs Assessment (SGS Economics & Planning, 2015) prepared for the Land Development Agency (refer to Appendix F17 in Appendix F). It is noted that this report was commissioned by the LDA (now SLA) and pre-dated the award of the tender.

11.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for socio-economics, health and recreation in **Section 11.1** above, the potential impacts of the proposed redevelopment of the CBP relating to socio-economics, health and recreation may be characterised as:

- Design does not adequately reflect the character of the surrounding suburb.
- Inadequate attention to design and layout results in a lack of passive surveillance and hence impacts on public safety.
- Design does not include adequate accessibility to urban parklands.
- Intensification of the use of the precinct causes a loss of residential amenity for surrounding areas due to increased traffic, dust and noise during both construction and operation.
- Inadequate existing social services within the area to support an increase in population as a result of the Proposal.

Detailed technical investigations have been undertaken for traffic, landscape and visual amenity, air quality, noise and contamination in accordance with ACT policies and guidelines, the results of which are presented in **Section 7.0**, **Section 9.0**, **Section 12.0**, **Section 13.0** and **Section 18.0** respectively. The discussion in this section specifically relates to the social impacts for residents and the potential loss of amenity for neighbouring residential areas in the vicinity of the CBP.

11.4.1 Design

The proposed design has been prepared in accordance with the Garden City principles demonstrated throughout Yarralumla. The Proposal would fully integrate with the surrounding urban landscape and would be consistent with the approved CMP (GML, 2021a). This has been discussed in **Section 3.3, Section 5.0** and **Section 9.0**. The design of the Proposal has also been undertaken through consultation with the Community Panel, as discussed in **Section 19.0**. The Proposal is considered unlikely to result in impacts to the character of the surrounding suburb.

11.4.2 Residential Amenity

Temporary traffic, noise and dust impacts may occur during construction. These impacts would be managed through the development and implementation of a CEMP. This would include measures such as covering stockpiles, use of water carts and spray systems, staging heavy vehicle road use, and using well serviced machinery with appropriate mufflers to reduce noise impacts. The CEMP would be prepared prior to commencement of construction within the Proposal Area.

Once operational, the Proposal would result in the generation of new noise sources for the surrounding residential area. However, as described in **Section 13.0**, having regard for the proposed noise management measures, including extensive landscaping and retention of the existing topography and the preparation of a Noise Management Plan (NMP) to be included within the OEMP; the Proposal is unlikely to exceed the ACT noise level criteria for the area. This is further discussed in **Section 13.0**.

As discussed in **Section 7.0**, through its design and provision of facilities, the Proposal is expected to adequately accommodate the increase in traffic in the Proposal Area and the surrounding road network. The Proposal provides suitable pedestrian/cycling and car parking arrangements that would encourage active travel, reduce impacts and assist in integrating the Proposal into the existing urban environment.

The visual impacts of the Proposal have also been considered in its design. Extensive landscaping would provide sufficient screening for surrounding property owners, and no building within the Proposal Area would exceed three storeys. As such, the scale and bulk of the Proposal would be appropriate for the surrounding existing suburb. Refer to **Section 9.0** for further discussion on potential visual impacts associated with the Proposal.

In addition, a number of design measures have been incorporated into the Proposal to assist in preserving amenity to existing surrounding residential properties. This includes providing a low-density zone along the eastern boundary of the Proposal Area, adjacent to existing residential areas. Furthermore, along the northern boundary with Lane Poole Place, landscape elements have been positioned to be associated with proposed residential dwellings, with a further buffer provided by the retention of Hardy Patent Kiln 2. On the eastern boundary, the 20 m buffer to the dwelling building line contains the new public road cul-de-sac, with associated footpaths and landscaping. Treating these two interfaces in this way provides a proper physical separation from the higher density and more active elements in the development.

11.4.3 Public Safety

The Proposal has been designed with consideration for the Crime Protection Through Environmental Design General Code (ACT Planning and Land Authority, 2011) and CPTED principles generally. This has included the following key principles:

- **Natural surveillance** (also referred to as 'passive surveillance') – this is intended to limit the opportunity for crime by designing spaces and buildings that encourage human activity and interaction as well as overlooking of the environment.
- **Natural access** – this involves 'channelling' the movement of people in the environment either to encourage them into spaces to increase activity and hence increase natural surveillance, or to discourage people from entering areas where it is generally inappropriate for pedestrian movement.
- **Territorial reinforcement** – this involves a sense of place and amenity being established; if people feel a sense of pride in their place of residence or activity, then there is a greater propensity to take care of the environment and look after those in the community.
- **Target hardening** – this is where the property owner or occupier seeks to deter criminal activity by making it as difficult as practicable to steal or vandalise property or buildings.

The design of the Proposal has adopted a number of measures to ensure it upholds these principles, with proposed residential dwellings designed to achieve privacy and amenity, but also allow for natural surveillance and engagement with their streets and surrounds.

The distribution of residential housing throughout the entire Proposal Area enhances public safety by providing natural surveillance to all the public areas, including the proposed Rails Playground and Quarry Parklands. Appropriate fencing and safety barriers throughout the Quarry Parklands will be incorporated into the detailed landscaping design of the Proposal.

The connections from the entry to Bentham Street and Denman Street for pedestrians and cyclists ensures the site is not isolated from the existing amenities offered in Yarralumla, whilst also providing easy non-vehicular access to the residents of Yarralumla. This encourages integration into the existing suburb, as opposed to creating an isolated area of development.

Whilst the Proposal would generally retain the existing topographical features, it is proposed to infill the north-eastern quarry spur. The access to this spur is narrow and secluded and does not produce a desirable CPTED outcome. Infilling this area satisfies the Estate Development Code requirement to enhance *'personal safety and perceptions of safety including way finding, passive surveillance and avoidance of entrapment points'*.

The activation of the brickyard buildings within the heritage core of the Proposal Area by allowing mixed land uses would also assist in encouraging activity and interaction. Celebrating the heritage of the brickyard by retaining its historical integrity (refer to **Section 17.0**) would also encourage a sense of place and connection with the urban environment. It is acknowledged that there is also a strong desire that demand for activities within the CBP does not overspill into the existing Yarralumla streets, and so the Proposal seeks to find this balance through its design.

Following these principles, uses and amenities have been proposed to create the optimal level of activity without requiring excessive infrastructure. These uses are designed to provide all day activation with unique offerings at an optimal scale. Importantly, each of the experiences provided within the Proposal's heritage core allows for interaction between residents, commercial operators, employees and existing Yarralumla residents as well as visitors from the wider Canberra area.

11.4.4 Existing Social Services

As aforementioned, the Proposal is expected to result in an approximate population yield of between 960–1,300 people. This represents a 33% to 45% population increase for the suburb of Yarralumla. This increase is likely to put significant pressure on existing social services within the area, in particular the Yarralumla, Deakin and Curtin local shops.

The Community Needs Assessment report completed in 2015 stated that additional services for retail/commercial, recreation and health facilities are likely to be required. The assessment was based on the proposed total of 1,800 dwellings at the time, which has since been decreased to 380 dwellings. Therefore, any additional services deemed to be required by the report are less likely to be required under the current Proposal. Additional services for aged care facilities, places of worship, emergency services, schools, community meeting spaces and youth facilities were not considered to be required under the previous 1,800 dwelling proposal and are consequently even less likely to be required under the current Proposal of 380 dwellings.

The report recommended that provision should be made for new small-scale local shops, and for a coffee shop/mini mart on-site at the precinct. The Proposal would provide adequate retail space for convenience retail facilities. It would be desirable for these to become available as soon as the population is large enough to make the facilities viable. This is likely to be associated with Stage 1 of the development, with the viability likely to be improved by patronage from construction workers.

Existing medical general practice and allied health services in Yarralumla and Deakin could provide services to the additional population generated by the CBP; however, there is likely to be scope for additional services to be provided within the proposed mixed use or commercial spaces, which could also provide services to residents outside of the CBP.

While the population of the CBP itself is not likely to generate enough demand for a new childcare facility, the location of the CBP between where people live and work is likely to mean that an additional childcare centre in this location would be attractive for parents from surrounding areas. As discussed in **Section 7.0**, the Proposal is expected to be accessible for both vehicles and active travel. Furthermore, the Proposal would provide commercial and retail space to service the proposed residential development. As such, some services may be provided within the Proposal Area, or the Proposal would facilitate access to services in the surrounding area, including Yarralumla, Deakin, Curtin and Canberra Civic.

It is noted that the provision of social housing was not a requirement of the Proposal. The ACT Government would be tasked with the provision of such services, if required in the future.

The specific provision of services within the Proposal Area would be subject to market demand and operational approval from the ACT Government. Nonetheless, the Proposal provides sufficient and suitable space for such uses.

11.4.5 Accessibility to Urban Parklands

The Proponent has been mindful of the public interest in the Proposal Area, and in particular for nearby Yarralumla residents, who enjoy the informal walking trails and existing landscape around the site. As a result, design of the Proposal seeks to enhance the natural setting of the Proposal Area and its surrounding context. The proposed landscape response seeks to ensure that extensive landscape elements are provided throughout the Proposal Area to encourage recreation and active travel.

The proposed residential zones would contrast with the raw industrial historic core. The Proposal Area aims to provide a lush green parkland for the dwellings to sit amongst, following the principles of the Garden City urban design style. The design of the Proposal has sought to ensure that each dwelling enjoys the amenity created by landscape elements that provide shade cooling to private outdoor spaces and also assist with privacy between dwellings. In addition, the scale of the proposed residential buildings presents an opportunity to allow most apartments to have their own piece of garden within the overall garden setting.

The Proposal also provides two distinct recreational/parkland areas, being the proposed Quarry Parklands and the Rails Playground.

As described in **Section 9.4.1**, the Quarry Parklands would provide a natural public open space to be used for recreation. In addition, the northern cliff walls of the parklands provide an opportunity to display and interpret the geology of the Yarralumla formation of the area and its fossil findings. Detailed design of the parklands may make use of specific vegetation that provides references to this geological history, which dates back approximately 450 million years.

The proposed Rails Playground would be located on the south-western boundary of the Proposal Area, historically the place where bricks were loaded onto rails for transport to Canberra construction sites. It is proposed that this area is transformed into a dynamic play park that interprets this history, establishing a formal and informal play and exercise landscape for all ages. Within the footprint of the old rail tracks, a sports, running and fitness track that links to the existing networks south of the site is being considered for the detailed design of the Proposal.

It is not proposed to fence the development off, so the boundaries are completely permeable to pedestrians from the adjacent woodlands.

It is considered that the design of the Proposal has provided adequate provision of urban parklands and recreational areas. The design of these areas would be further developed during detailed design to ensure that legible access to these parklands is maximised.

11.5 Proposed Mitigation Measures

11.5.1 Dust, Noise and Lighting

The construction team would operate under an existing Environmental Protection Agreement with the EPA to cover the works and a CEMP. Issues particular to the construction phase which potentially affect amenity for neighbouring residents would be minimised through implementation of a range of measures to be incorporated into the CEMP, such as those outlined in **Section 9.0**, **Section 12.0** and **Section 13.0.**

The Proposal would have vehicular street connections to Dudley Street, Bentham Street and Denman Street. As required by TCCS, emergency vehicle access links have been provided to connect these site access points; however, normal vehicular access would not be possible. This would prevent the road network from becoming a thoroughfare for vehicles; an undesirable outcome for residents of both the CBP and surrounding residential areas.

As discussed in **Section 13.0** of this EIS, a NMP would be developed for the Proposal Area, in order to manage ongoing operational noise impacts of both the proposed residential and commercial/mixed uses.

The operational impacts of the Proposal in recreational areas would be managed through the implementation of an OEMP (refer to **Section 13.0** of this EIS).

11.5.2 Masterplan Design

The Yarralumla Neighbourhood Plan 2004, Garden City Values and Principles 2008, and the Canberra Brickworks and Environs Planning and Development Strategy provide a comprehensive framework for the desired character for Yarralumla. The Proposal recognises the values identified for Yarralumla and has developed a considered response.

The Proposal delivers a precinct reflective of Canberra's Garden City character through its proposed layout, scale of built form, housing typology and landscape design. It would be connected and accessible, provide high quality communal and private open space, would prioritise and enhance the landscape, and create generous tree lined streetscapes. Homes would be designed to achieve privacy and amenity but also to allow for casual surveillance and engagement with their streets and surrounds. The Proposal would achieve a compact and liveable neighbourhood that seamlessly integrates with the existing Garden City character of adjacent suburbs.

The Proposal has been designed with consideration for the Crime Prevention Through Environmental Design General Code (ACT Planning and Land Authority, 2011) and CPTED principles generally.

Specific design features that have been introduced into the Masterplan to address potential environmental effects relative to the operational phase of the Proposal as it relates to the amenity of existing residential properties adjoining the CBP and proposed residential properties within the CBP include:

- A low-density residential zone would be provided at the eastern end of the site as it has the greatest interface with existing neighbours (refer to **Section 5.0**)
- Along the north boundary with Lane Poole Place, landscape elements would be positioned with regard for the residential dwellings proposed within the Proposal Area, with a further buffer provided by the retention of Hardy Patent Kiln 2.
- On the eastern boundary, an approximate 20 m buffer to the dwelling building line would exist through a new public road cul-de-sac, with associated footpaths and landscaping.
- Considered design to ensure that noisy uses are kept distant from residential dwellings.
- The house blocks sited at the end of Denman Street are scaled to be consistent with the surrounding housing architecture and also provide a measured introduction to new development in the Precinct.

- No new structures have sight lines into the gardens and living areas of neighbouring residential blocks. The separations are designed to provide residential privacy.
- The Proposal would convert the existing quarry pit and rail remnants into recreational publicly accessible open space.

Provision of social services would be subject to market demand and ACT Government policy. However, the Proposal would provide adequate commercial and mixed-use space to accommodate such uses.

It is considered that the potential socio-economic, health and recreation impacts of the Proposal can be sufficiently managed through its design and through the implementation of an industry best practice CEMP and OEMP.

The application of these mitigation measures to the risks identified in **Section 11.1** and their associated residual risks are outlined below in **Section 11.6**.

11.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
S1	Design the Proposal in accordance with Garden City principles and the approved CMP (GML, 2021a). Establish a community panel for ongoing engagement and input into the design of the Proposal (completed). Ensure community panel is engaged throughout the design and assessment process.	1-remote	4-major	W	Yes
S2	Design the Proposal according to CPTED principles and the Estate Development Code. Incorporate design features that minimise impacts to surrounding residential properties (see **Section 11.5.2**). Design the Proposal in accordance with the Yarralumla Plan, Garden City Values and Principles, and the approved CMP (GML, 2021a).	1-remote	3-moderate	L	Yes
S3	Incorporate parkland into the design of the Proposal (completed).	2-unlikely	2-minor	L	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Construction					
S4	The CEMP is to include measures to control dust, noise and lighting to minimise impacts on nearby residents. Refer to mitigation measures for noise, vibration, lighting, landscape and visual. Operate under the existing Environmental Protection Agreement with the EPA.	2-unlikely	3-moderate	W	Yes
Operation					
S5	Refer to mitigation measures for noise, vibration, lighting, landscape and visual. Implement an industry best practice OEMP, including measures to manage landscape and visual, noise, vibration and lighting impacts in **Sections 9.5** and **13.5** respectively. Ensure street connections between Dudley Street, Bentham Street and Denman Street are not publicly accessible to prevent the road network from becoming a thoroughfare.	2-unlikely	2-minor	L	Yes
S6	Provide mixed use and commercial spaces that may accommodate social services, such as a medical general practice or childcare facility.	2-unlikely	3-moderate	W	Yes

It is apparent through the mitigation measures proposed that the majority of environmental risks associated with socio-economic, health and recreation impacts can be appropriately managed for the Proposal.

12.0 Climate Change and Air Quality

Section Summary
This Section addresses greenhouse gas (GHG) emissions arising from construction and operation of the Proposal and impacts from climate change. It also outlines mitigation measures to address any residual impacts. A Climate Adaptation Plan has been prepared for the Proposal and is contained within Appendix F18 in **Appendix F**.

12.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
CC1	A failure to properly position residential dwellings in the precinct may result in an over-reliance on heating and cooling.	3-possible	3-moderate	M	No
CC2	Increase in GHG emissions from materials, transportation and construction.	3-possible	3-moderate	M	No
Construction					
CC3	Dust emissions during construction resulting in health problems for both workers and neighbours.	2-unlikely	4-major	M	No
CC4	Increase in GHG emissions as a result of using fuel-based plant and equipment.	3-possible	3-moderate	M	No
CC5	Increase in GHG emissions as a result of transportation of materials and staff movement.	3-possible	3-moderate	M	No
Operation					
CC6	Additional residential and vehicular activities result in increases in GHG emissions.	3-possible	3-moderate	M	No
CC7	Future (2030 and 2070) increase in extreme air temperatures affecting occupant and visitor comfort and causing death of vegetation in the wetland treatment system.	4-likely	2-minor	M	No

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
CC8	Future (2030 and 2070) increase in extreme air temperatures leading to potential loss of trees/plants which aren't designed to withstand conditions, and heat retention from increased concrete and hard, landscaped areas.	4-likely	2-minor	M	No
CC9	Current and future (2030 and 2070) increase in extreme air temperatures causing technology exposure, equipment overheating, and bushfire threat causing damage to infrastructure and restricted emergency services access.	3-possible	3-moderate	M	No
CC10	Future (2030 and 2070) increase in >35°C days causing pedestrian discomfort.	3-possible	2-minor	W	No
CC11	Future (2070) increase in >35°C days causing exposed buildings to have increased speed in degradation of building materials, facades, and hardscaped areas.	3-possible	3-moderate	M	No
CC12	Future (2030 and 2070) increase in >35°C days causing heat retention in exposed metal contact (handrails, kids playgrounds etc), and exposed railroad tracks.	4-likely	4-major	V	No
CC13	Current and future (2030 and 2070) bushfires within the proximity of the development may lead to smoke and limited visibility/poor air quality for occupants and visitors.	3-possible	4-major	H	No
CC14	Future (2030 and 2070) bushfires may lead to loss of property or life.	3-possible	5-catastrophic	V	No
CC15	Current and future (2030 and 2070) increase in extreme wet weather causing flooding and subsequent damage to infrastructure and services, increase in stormwater runoff, and increased severity of hailstorms causing damage to property and personal injury.	3-possible	4-major	H	No
CC16	Future (2030 and 2070) increase in extreme wet weather causing excess water ingress leading to loosening of soils and potentially affecting stability of the heritage chimney.	3-possible	4-major	H	No
CC17	Current and future (2030 and 2070) increase in extreme wet weather causing potential flooding of lower level carparks.	3-possible	3-moderate	M	No

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
CC18	Future (2070) increase in extreme wet weather resulting in flow paths through the heritage area.	3-possible	3-moderate	M	No
CC19	Drought causing current and future (2030) reduction in water availability for wetlands and irrigation.	3-possible	3-moderate	M	No
CC20	Drought causing future (2070) reduction in water availability for irrigation.	3-possible	3-moderate	M	No

12.2 Existing Conditions and Values

Canberra has a temperate climate with hot summers, dry autumns and cool winters. Rainfall can be highly variable across years. The key observations from the Bureau of Meteorology Tuggeranong weather station, located approximately 10 km to the south of the CBP, between 1996 and 2020 are:

- Annual mean maximum and minimum temperatures are 20.9°C and 7.0°C, respectively. The mean number of days per year above 35°C is 9.1 days.
- The mean total annual rainfall is 607 mm, with mean rainfall higher in November through to February. The mean number of days per year with rainfall above 10 mm is 20 days.
- Relative humidity at 9am typically ranges between 59–83% and is generally higher in the winter months.

The ACT Government has recognised that the climate of Canberra is already changing and that extreme weather events will occur more frequently and with more intensity, particularly heatwaves, droughts, storms and bushfires. The ACT Climate Change Strategy 2019–25 outlines that more hot days (above 35°C) and fewer cold nights in the ACT region are already observed, with the hottest Canberra day in history observed in January 2020 with 44°C recorded in the Canberra CBD.

Canberra's Living Infrastructure Plan showed that the urban heat island (UHI) effect showed up to a 10°C temperature difference between different parts of Canberra on a hot day.

12.3 Investigations

The Proponent is committed to meeting the Green Building Council of Australia's (GBCA) requirements to achieve five stars under Green Star Communities v1.1 rating tool for the Proposal. As part of this commitment, the following reports have been prepared:

- Former Brickworks Redevelopment, Yarralumla: Climate Adaptation Plan (Arup, 2021a) prepared for BLOC (Appendix F18 in **Appendix F**).
- Brickworks Redevelopment, Yarralumla - GHG technical input for EIS (Arup, 2021b) prepared for Umwelt (Appendix F18 in **Appendix F**).
- Yarralumla Brickworks: Landscape Master Plan (McGregor Coxall, 2021a) (refer to Appendix F46 in **Appendix F**) (DRAFT).

In predicting impacts from climate change, the Representative Concentration Pathway 8.5 from CSIRO's Australian Climate Futures was used, as it represents the worst-case emissions scenario, and therefore is a conservative prediction for climate projections. Two time periods, 2030 and 2070, were selected as climate scenarios that represent the near-term and long-term design life of the CBP development and associated infrastructure components (ARUP, 2021a).

12.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for climate change and air quality in **Section 12.1** above, the potential impacts of the proposed redevelopment of the CBP relating to climate change and air quality may be characterised as:

- Increase in dust emissions during construction.
- Increase in Greenhouse Gas (GHG) emissions from construction and operation.
- Increase in frequency and intensity of extreme weather events, particularly heatwaves, droughts, storms and bushfires.
- Urban heat island effect compounding extreme temperatures.

These potential impacts are analysed further below.

12.4.1 Dust Emissions

Construction activities are likely to generate dust emissions. Key sources of dust emissions include demolition, excavation, sanding/grinding, on-site traffic movements, masonry activities, concrete drilling and cutting, and wind erosion from stockpiled materials. Dust emissions have the potential to cause adverse on-site and off-site impacts if they are not properly managed.

These impacts will be managed through the development and implementation of a CEMP prior to construction commencing. The CEMP will include dust suppression management methods, such as dampening stockpiles, ensuring truckloads of soil and loose material are covered, and limiting work during high winds.

12.4.2 Greenhouse Gas Emissions

12.4.2.1 Design

Embodied emissions in materials, transportation and construction account for approximately 11% of the total GHG emissions across the whole life cycle of a development. The remaining majority of GHG emissions are attributed to the operational phase, specifically the heating, ventilation and cooling of the final development. The two most common sources of GHG emissions for buildings are purchased electricity and direct consumption of natural gas for heating and cooking.

Design that encourages cross ventilation to catch both the sun and breezes, consistent with improved solar passive design, will be incorporated where possible, particularly in Precincts 2, 3, and 5-9. Precincts 1 and 4 have sought to maximise solar orientation, noting design constraints due to the presence of the heritage core and remnant railway.

As demonstrated in the draft Landscape Masterplan (McGregor Coxall, 2021a) (refer to Appendix F46 in **Appendix F**) of the Proposal Area, substantial replanting is proposed for the CBP. The purpose of this landscaping is to both integrate the Proposal with the surrounding character of Yarralumla, as well as to provide natural cooling and minimise radiant heat from surrounding hard surfaces. The use of deciduous trees would provide appropriate shading through varied seasons within the public realms and parkland areas, as well as further cooling effects to mitigate urban heating and encourage outdoor activity.

The Proponent is also committed to incorporating design elements into the EDP that will achieve five Green Star Communities rating by the GBCA. The precise details of these design elements will be finalised during subsequent development application phases. However, a confirmed design feature of the Proposal that would enhance its thermal efficiency, as well as integrate with the heritage significance of the CBP, is the use of brick as a dominant building material. Brick buildings are known to have a high thermal mass; during summer they absorb heat during the day, and release heat during the evenings and night, providing thermal comfort. In winter, the same mass can store heat from heaters or the sun, releasing it at night when temperatures are at their lowest. The use of brick as a dominant material for new terraces, apartments and houses will increase the thermal value of the Proposal, contributing toward energy efficiency and lower heating and cooling demand. High performance facades, combined with high levels of insulation to external walls, floors and roofs will also enhance the thermal mass to minimise impacts of external temperature fluctuations. Further design commitments are outlined below in **Section 12.5.2**. Through the Proponent's commitment to achieve five Green Star rating for the Proposal, which must be assessed and accredited by the GBCA, it is considered that potential impacts associated with GHG emissions will be appropriately managed.

12.4.2.2 Vehicular Activity

Potential impacts from the CBP also include an increase in GHG emissions from vehicular activities. Most vehicular emissions will occur during the operational phase from the use of private vehicles. This impact is difficult to quantify as the majority of new residents may already have private vehicles, which would not cause an increase in GHG emissions. Therefore, the number of additional vehicles on the road as a result of the development was estimated to quantify vehicular emission impacts from the CBP. The additional emissions have been modelled to be in the range of 33,000 to 100,000 kg CO2-e per year, and it is expected that the actual figure will be towards the lower range of this estimate.

The Proponent has sought to find a balance between providing adequate parking and vehicular access to the Proposal Area, and limiting GHG emissions produced by vehicles. During construction, this will be managed through a CEMP with management strategies such as limiting the idling of vehicles and machinery, and ensuring plant and equipment are used according to their design specifications. During operation, the CBP will include electric vehicle (EV) charging stations. The precise number and location of these EV stations will be confirmed during the development application phase. The Proposal will also provide conduits throughout residential carparking areas to enable owners to fit EV charging stations.

Footpaths would also be provided throughout the entire CBP to encourage active travel, utilising CPTED principles to facilitate public safety. These footpaths would integrate with the surrounding Yarralumla footpath network.

12.4.2.3 Construction Impacts

There are a number of potential impacts associated with GHG emissions during construction. These include:

- Increase in GHG emissions as a result of using fuel-based plant and equipment.
- Increase in GHG emissions as a result of transportation of materials and staff movement.

A range of plant and equipment will be required for the construction of the Proposal. Fuel efficient and less fuel-intensive plant and equipment would be selected where practical and feasible, noting that there may be limited options for certain type of equipment.

These impacts would be managed through the implementation of a CEMP, as described in **Section 12.5.2** below.

12.4.3 Climate Change Impacts

As mentioned in **Section 12.2**, the ACT Government has recognised that the climate of Canberra is already changing and that extreme weather events will occur more frequently and with more intensity, particularly heatwaves, droughts, storms and bushfires.

Projected changes for each of the climate variables relevant to the Canberra region are (Arup, 2021a, Appendix F18 in **Appendix F**):

- Increased variability in mean rainfall depending on the season, with a predicted change to rainfall varying between -19% to +28% in summer and -12% to +48% in autumn by 2030; and a predicted change of -9% to +54% in autumn by 2070.
- Increased extreme rainfall, with a 10% increase in rainfall intensity for every 1.0°C increase in temperature.
- Average daily minimum and maximum temperatures are expected to increase by between 0.6°C and 2.0°C, with the number of >35°C days increasing by an additional 1–5 days by 2030 and 10–20 days by 2070.
- Increase in average Forest Fire Danger Index.

These changes to climate variables could cause impacts to the Proposal including:

- Increase in average air temperatures and extreme weather events (days >35°C) affecting occupant and visitor comfort and safety, vegetation health, and equipment functioning.
- Bushfires causing damage to infrastructure, restricted emergency services access, and smoke and limited visibility/poor air quality for occupants and visitors.
- Increase in extreme wet weather causing flooding and subsequent damage to infrastructure and services (including heritage areas).
- Increase in the severity of hailstorms causing personal injury and damage to property.
- Drought, causing reduction in water availability for wetlands and irrigation.
- Wind, causing increased structural load on buildings and infrastructure.
- Changes to native habitat, potentially impacting threatened species and ecological communities.

In response to these impacts, the Proposal is seeking to achieve five Green Star rating by demonstrating adaptable, resilient and sustainable design. While design features will be refined during the detailed design process, the Proponent has committed to a number of elements, as outlined in **Section 12.5.3** below.

In addition, the Proponent has sought to maintain consistency with the ACT Climate Change Strategy priorities and Canberra's Living Infrastructure Plan actions as outlined in **Table 12.1** and **Table 12.2** below.

Table 12.1 ACT Climate Change Strategy Priorities

Priority	CBP response
Energy, buildings, and urban development	
Encourage a shift from gas to electricity by removing the mandated requirement for gas connection in new suburbs, supporting gas to electric appliance upgrades and transitioning to all-electric new builds.	Use of gas has been minimised where possible. Installation of gas infrastructure is proposed to enable the use of future decarbonised renewable gas alternatives. This is discussed in detail in **Section 6.4.1.4**.
Improve liveability and adapt to the impacts of climate change by implementing Canberra's Living Infrastructure Plan to ensure adequate and appropriate mature tree cover, account for the value of living infrastructure and assess local needs for managing heat.	The CBP redevelopment has planned landscaping features to provide high levels of tree cover.
Transport	
Encourage active travel by continuing to improve cycle paths and walkability.	The CBP design incorporates links to existing cycle paths and a variety of walking paths.
Continue to encourage the uptake of zero emissions vehicles and explore the need for further incentives.	The CBP residential design will provide conduits throughout the carpark to enable owners to fit electric vehicle (EV) charging stations in bays to enable EV choice. The Proposal will provide EV stations, with numbers and locations to be determined during detailed design.

Priority	CBP response
Plan for a compact and efficient city to improve access to public transport and active travel options, reduce travel distances and reliance on private car use.	The CBP is located on a major public transport link and is a brownfield infill development aiding to reduce urban sprawl and maintain a compact city.
Waste avoidance and management	
Investigate options to divert additional organic waste from landfill by requiring key sectors to have a separate organic waste collection.	A large number of trees would be removed from the CBP site at the commencement of the redevelopment, but waste management measures would be put in place to divert organic waste from landfill wherever possible.

Table 12.2 Canberra's Living Infrastructure Plan Actions

Action	CBP Response
Action 1: Complete inventory and mapping of living infrastructure and expand the public urban infrastructure asset management system to include urban living infrastructure to inform investment decision making, whilst investigating steps to implement an accounting framework, such as the United Nations System of Environmental Economic Accounting (SEEA), to value urban living infrastructure.	Not relevant. Though it is noted that the Proposal includes provision of public urban infrastructure, such as public space and recreational areas.
Action 2: Achieve 30% tree canopy cover (or equivalent) and 30% permeable surfaces in urban areas by 2045.	The Proposal will exceed these targets through extensive landscaping and provision of parkland. Refer to the draft Landscape Master Plan provided in Appendix F46 in **Appendix F.**
Action 3: Prepare a Microclimate Assessment Guide and mandate its use to inform policy and forward planning studies for centres, urban renewal projects and urban intensification precincts, with initial assessment of priority locations to inform a city cooling works program.	The ACT Government has not prepared a Microclimate Assessment Guide at the time of preparation of this EIS. However, the Proponent has undertaken GHG emission modelling and prepared a Climate Adaptation Plan to develop appropriate precinct cooling strategies. These are further outlined in **Section 12.5** below.
Action 4: Introduce requirement(s) for microclimate assessments of significant developments located in centres, urban renewal projects and urban intensification precincts, to assist with development assessment.	A microclimate assessment has not been mandated for the Proposal. However, the Proponent has prepared a Climate Adaptation Plan to develop appropriate management strategies for climate adaptation and resilience. These are further outlined in **Section 12.5** below.
Action 5: Prepare a guide for use by the community and built environment professionals to support effective landscape plans, and increase the opportunity for healthy, climate resilient and biodiverse gardens and public lands.	While no guide has been prepared as yet, the Proposal has prepared a draft Landscape Master Plan (refer to Appendix F46 in **Appendix F**) that seeks to enhance outdoor spaces and provide climate resilience through increased permeable areas and high canopy cover.

Action	CBP Response
Action 6: Require multi-dwelling, mixed use and commercial development applications (DA) to have landscape plans that demonstrate how surface treatments and tree canopy cover targets will be met, and change the processes for certification of DA compliance accordingly.	The Proposal has prepared a draft Landscape Master Plan (refer to Appendix F46 in **Appendix F**) that exceeds the 30% canopy cover and 30% permeable surfaces targets.
Action 7: Expand Actsmart web-based information and programs to incorporate the Climate-wise Landscape Guide to encourage and support community efforts to improve sustainability outcomes.	Not relevant.
Action 8: Review and update the ACT Tree Protection Act 2005 to ensure consistency with the objectives of the Plan and suitability to Canberra's changing climate.	Not relevant. No registered trees within the Proposal Area.
Action 9: Develop a strategic plan for the public urban forest that outlines how the urban forest can be maintained and enhanced to improve amenity in a changing climate and deliver biodiversity outcomes.	The Proposal is consistent with the vision and objectives of the ACT Urban Forest Strategy. The Proposal will provide high quality landscaping, with extensive replanting across the Proposal Area to enhance Canberra's urban forest.
Action 10: Trial city cooling initiatives in high priority locations.	The Proposal will implement natural cooling initiatives through the provision of extensive canopy cover and sheltered areas. Much of the Proposal Area will also contain both public and private open space, thereby enhancing permeable surfaces and reducing the potential for radiant heat from hard surfaces.
Action 11: Trial local park upgrades in high priority locations including watered grass, trees, seats, lights and drinking fountains.	The Proposal includes the provision of high quality landscaped urban parkland with the provision of grassed areas, trees, seats, lights and drinking fountains.
Action 12: Support the amenity and safety of active travel on trunk cycle and pedestrian routes with tree canopy shade and water points at key destinations.	Extensive canopy cover will be provided throughout the Proposal Area, particularly along pathways and roads. Canopy cover will also be provided throughout the proposed parkland.
Action 13: Showcase best practice climate-wise design through display houses and exhibition sites in Government projects.	The Proponent is open to working with the ACT Government in providing exhibition sites where appropriate.
Action 14: Support trials and demonstration projects to retrofit infrastructure to allow hydration of open spaces using stormwater.	The Proposal would utilise stormwater as a means of irrigating the surrounding parkland. This is further discussed in **Section 10.0.**
Action 15: Investigate ways to encourage and incentivise living infrastructure on existing and future buildings in Canberra.	The Proponent is open to incorporating living infrastructure into its design.

The Proponent's commitment to achieve five Green Star Rating by the GBCA is considered to provide an appropriate and adequate response to these potential impacts. The Proposal is considered to be in keeping with the vision of the ACT Climate Change Strategy and Canberra's Living Infrastructure Plan.

12.4.4 Urban Heat Island Effect

The Urban Heat Island (UHI) effect, resulting from factors such as choice of materials and type of land cover, can lead to greater absorption of solar radiation, reduced convective cooling and higher water evaporation rates. This can cause up to a 10^{o}C temperature difference between different parts of Canberra on a hot day. If the CBP fails to properly position residential dwellings in the precinct, and uses materials inappropriate for the climate, the UHI effect could compound the impact of extreme air temperatures and impact occupant and visitor comfort and safety, vegetation health, and equipment functioning, and lead to greater power consumption for climate control.

As outlined in **Section 12.5.4** below, the Proposal will incorporate a number of design measures to limit the UHI effect within the CBP. As demonstrated within the proposed draft Landscape Master Plan (refer to Appendix F46 in **Appendix F**), the Proposal will also have a significant canopy cover, focused particularly along the road/footpath network, to minimise radiant heat from hard surfaces. Through the provision of urban parkland, the Proposal will also have a high percentage of permeable surfaces, which will assist in absorbing solar radiation.

12.5 Proposed Mitigation Measures

The proposed mitigation measures for the Proposal aim to address the three categories of impacts described in **Section 12.4**. As the impacts are interrelated, many of the measures contribute towards mitigating several impacts.

12.5.1 Dust Emission Management

Dust emissions would be managed through the implementation of a CEMP. Wherever possible, sources of dust, such as the excavation process itself, transfer points and routes for trucks will be evaluated to determine means for minimising dust emissions. This would include measures, such as:

- Dust suppression, including through dampening and/or covering of stockpiles.
- Isolation of excavated areas and transfer points.
- Covering of trucks when travelling off site or hauling over long distances.
- Minimisation of exposed soil surfaces and regeneration as soon as practical.

12.5.2 Emissions Reductions

In reducing emissions, the design principles guiding the development of the CBP aim to reduce reliance on mechanical heating and cooling, using the existing building design and orientation to achieve solar passive design. Measures to reduce GHG emissions from the construction and operation of the CBP include:

- Orientation of dwellings to maximise the sun exposure in winter and minimise exposure in summer.
- Designing buildings to allow cross ventilation to reduce reliance on mechanical ventilation.
- Limiting the level of direct sun exposure during summer months by utilising window shading structures (overhangs), eaves, or balconies for apartments.

- Use of sustainable natural materials which have low embodied energy and low life cycle impact in construction where practicable, such as timber, recycled steel, aluminium and glass.
- The use of brick as a dominant material in building the new terraces, apartments and houses to increase the thermal value (i.e., absorbing heat during the day and releasing at night), contributing towards energy efficiency.
- High performance facades combined with high levels of insulation to external walls, floors and roofs to enhance thermal mass and minimise impacts of external temperature fluctuations.
- Introduction of a rooftop photovoltaic system to the core heritage buildings to provide for the precinct's energy usage and aim for a central heritage precinct that is 'net electricity neutral'.
- Use of LED and low energy lighting.
- Facilitating easy and direct access to public transport and light rail for residents through integrated footpaths and road network.
- Provide EV charging stations and conduits throughout carparks to enable residents to fit EV charging stations in bays to enable EV choice.

Construction impacts associated with the release of GHG emissions from plant and machinery would be managed through a CEMP. This would include measures such as:

- Where possible using locally sourced materials to reduce GHG emissions associated with materials transport.
- Recovery and recycling of construction and demolition waste where possible (once operational, the option to compost vegetation waste would also be provided for residents, where appropriate).
- Reuse of recycled materials where possible to reduce GHG emissions associated with embodied energy.
- Incorporation of construction/transport plans within the CEMP to minimise the use of fuel during construction.
- Assessment of the fuel efficiency of construction plant/equipment prior to selection, and where practical, use of equipment with the highest fuel efficiency and which uses lower GHG intensive fuel (e.g. biodiesel).
- Regular maintenance of equipment to maintain good operations and fuel efficiency.

12.5.3 Climate Change Resilience

The Proposal will be seeking to achieve five stars under Green Star Communities v1.1 rating tool. The Green Star Communities tool assesses a Communities scale development based on four categories, namely Governance, Liveability, Economic Prosperity and Environment. This will be independently assessed and accredited by the GBCA.

To assist in achieving this, the Proposal has prepared a project-specific Climate Adaption Plan (ARUP, 2021a), which will be updated throughout the development of the Proposal. In addition, a Community Resilience Plan is being developed, and will be informed by the outcomes of the Climate Adaption Plan.

Adaptation responses to be incorporated into the design of the Proposal to improve resilience to climate change impacts include:

- Wetland water levels monitored during heatwaves and adjusted as required to keep plants alive.
- Replanting program for any plants lost during extreme events.
- Outdoor parking undercover or underground.
- Locate systems appropriately. Providing shelter for equipment will reduce the impacts of UV radiation, weather and increased temperature.
- Maintain asset protection zones in accordance with the ACT Strategic Bushfire Management Plan and reduce fuel loading of green spaces.
- Investigate use of alternative materials for playground equipment to minimise heat retention.
- Deeper balconies proposed for western facing apartments, consideration of shading structures for afternoon sun, and appropriate glazing selection to reduce solar heat penetration.
- 100% recycled air in majority of apartments to minimise smoke impacts from nearby bushfires.
- Locating power and communications infrastructure underground to reduce bushfire threat.
- Use of designated access/street for accessibility of emergency service vehicles.
- Chimney stacks currently structurally sound but will continue to be monitored as part of ongoing management for structural performance. Structures to be retained will be waterproofed.
- Assess parking access and road levels to assist in stormwater management and minimise water ingress and provide strategies to manage excess water flow to minimise flooding risk to lower carparks.
- Specification of durable materials to maximise lifespan of building components.
- Implement water management strategies outlined in **Section 10.0** of this EIS.

Note: adaptation responses for climate resilience were not proposed for items identified as 'low' risk.

12.5.4 Urban Heat Island Reduction

Adaptation responses to be incorporated into the design of the CBP to reduce the UHI effect include:

- Tree canopy/planting, maximising canopy coverage where appropriate, and as identified in the Draft Landscape Master Plan (refer to Appendix F46). The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas.
- Green roofs/green walls to be incorporated during detailed design.
- Use of the old conveyor as an active water feature, to move water from Pittman Park around the site, contributing to evaporative cooling.
- Permeable surfaces (paving) for additional cooling effects and stormwater management to be incorporated during detailed design.

- Shade structures and vegetated pergolas which can be used to combat high solar radiation intensity on hot summer days will be explored in the design phase.
- Solar reflective or light-coloured paints/coatings and pavements will be used where appropriate, in particular for the open space areas, to increase albedo and solar reflectance.
- Use of alternative materials for playground equipment to be investigated to minimise heat retention.
- Develop an industry best practice OEMP to ensure trees are regularly maintained to ensure natural shading is provided throughout operation of the Proposal.

Combining a number of these strategies can have a cumulative effect and better outcomes when employed together.

12.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
CC1	Design the Proposal using sustainable environmental design principles, including design responses included in **Section 12.5.3** and **Section 12.5.4**.	2-unlikely	3-moderate	W	Yes
CC2	Use of sustainable natural materials in construction which have low embodied energy and low life cycle impact, such as timber, recycled steel, aluminium and glass. The use of brick as a dominant material in building the new terraces, apartments and houses which will increase the thermal value (i.e., absorbing heat during the day and releasing at night), contributing towards energy efficiency. Introducing a rooftop photovoltaic system to the core heritage buildings, to provide the precinct's energy usage and aim for a central heritage precinct that is 'net electricity neutral'. Facilitating easy and direct access to public transport and light rail for residents through integrated footpaths and road network. Provide EV charging stations and/or conduits throughout the carpark to enable residents to fit EV charging stations in bays to enable EV choice.	3-possible	2-minor	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Construction					
CC3	Implement an industry best practice CEMP including measures such as: Dust suppression, including through dampening and/or covering of stockpiles. Isolation of excavated areas and transfer points. Trucks to be covered when travelling off site or hauling over long distances. Minimisation of exposed soil surfaces and regeneration as soon as practical.	2-unlikely	3-moderate	W	Yes
CC4	Implement an industry best practice CEMP. Construction and demolition waste would be recovered and recycled where possible, and vegetation waste would be composted. Recycled materials would be reused where possible to reduce GHG emissions associated with embodied energy. Fuel efficiency of the construction plant/equipment would be assessed prior to selection, and where practical, equipment with the highest fuel efficiency and which uses lower GHG intensive fuel (e.g. biodiesel) would be used, where practicable. Regular maintenance of equipment would be undertaken to maintain good operations and fuel efficiency.	2-unlikely	3-moderate	W	Yes
CC5	Where possible, using locally sourced materials to reduce GHG emissions associated with transport. Construction/transport plans would be incorporated within the CEMP to minimise the use of fuel during construction.	2-unlikely	3-moderate	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Operation					
CC6	Orientation of dwellings, where possible, to maximise the sun exposure in winter and minimise exposure in summer. Designing buildings to allow cross ventilation to reduce reliance on mechanical ventilation. Provide EV charging stations and/or conduits throughout the carpark to enable owners to fit EV charging stations. Use of low energy and LED lighting. Facilitating easy and direct access to public transport and light rail for residents through integrated footpaths and road network.	2-unlikely	3-moderate	W	Yes
CC7	Wetland water levels monitored during heatwaves and adjusted as required to keep plants alive. Replanting program for any plants lost during extreme events. Outdoor parking undercover or underground. Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas.	4-likely	1-insignificant	W	Yes
CC8	Replanting program for any plants lost during extreme events. Increase green space and canopy cover of the area. Develop an industry best practice OEMP to ensure trees are regularly maintained to ensure natural shading is provided throughout operation of the Proposal. Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas. Shade structures and vegetated pergolas which can be used to combat high solar radiation intensity on hot summer days will be explored in the design phase.	4-likely	1-insignificant	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
CC9	Locate systems appropriately. Providing shelter for equipment will reduce the impact of UV radiation and weather and increased temperature. Locate power and communications infrastructure underground. Maintain asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Reduce fuel loading of green spaces. Use of designated access/street for emergency service vehicles.	3-possible	2-minor	W	Yes
CC10	Outdoor parking undercover or underground. Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas.	3-possible	1-insignificant	L	Yes
CC11	Specification of durable materials to maximise lifespan of building components.	3-possible	2-minor	W	Yes
CC12	Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas. Use of alternative materials for playground equipment to be investigated to minimise heat retention.	2-unlikely	4-major	M	Yes
CC13	100% recycled air in majority of apartments.	3-possible	3-moderate	M	Yes
CC14	Maintain asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Reduce fuel loading of green spaces.	3-possible	3-moderate	M	Yes
CC15	No further mitigation measures proposed as flooding impact not considered high risk.	3-possible	3-moderate	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
CC16	Chimney stacks currently structurally sound but will continue to be monitored as part of ongoing management for structural performance. Structures to be retained will be waterproofed.	3-possible	3-moderate	M	Yes
CC17	Assess parking access road levels to minimise water ingress and provide strategies to manage excess water flow.	3-possible	2-minor	W	Yes
CC18	Implement management measures outlined in **Section 10.0**. Design would meet the requirements of the WSUD General Code (EPSDD, 2020) to ensure post-development flows do not exceed pre-development flows.	3-possible	2-minor	W	Yes
CC19	Implement management measures outlined in **Section 10.0**.	3-possible	2-minor	W	Yes
CC20	Implement management measures outlined in **Section 10.0**.	3-possible	2-minor	W	Yes

There are some medium level residual risks associated with extreme weather impacts from climate change. Many of these have been reduced from high risks with mitigation and management measures and now have a risk as low as reasonably practicable. The mitigation measures proposed can appropriately manage the majority of environmental risks associated with climate change and air quality impacts.

13.0 Noise, Vibration and Lighting

Section Summary
This Section addresses impacts arising from both the construction and operational phases of the Proposal with respect to noise, vibration and lighting. It also outlines mitigation measures to address any residual impacts.

13.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
N1	Inadequate attention to design and layout results in noise and lighting impacts on neighbouring residents.	2-unlikely	3-moderate	W	No
Construction					
N2	Inappropriate selection of machinery and plant resulting in unexpected environmental impacts (noise, dust emissions, vibration).	3-possible	3-moderate	M	No
N3	Construction noise and vibration resulting in reduced local amenity and impacts to heritage structures.	3-possible	4-major	H	No
Operation					
N4	Increases in residential activity may lead to additional noise and lighting during operation in and adjacent to the precinct.	3-possible	3-moderate	M	No

13.2 Existing Conditions and Values

In its present condition the Proposal Area produces no noise, vibration or lighting impacts as the site is unused, not operational, and inaccessible to the public.

The existing acoustic environment in the area surrounding the CBP is dominated by road traffic noise from Adelaide Avenue and Yarra Glen, and Dudley Street to a lesser degree. There is also some noise contribution from more infrequent traffic along Denman Street. The existing noise environment at individual noise sensitive receivers in the area surrounding the CBP is generally dependent on their proximity to nearby roads (Umwelt, 2021a).

13.3 Investigations

The key investigations considered in this Section include:

- Noise Impact Assessment, Canberra Brickworks Precinct Development (Umwelt, 2021a) (Appendix F19 in **Appendix F**).
- Public Lighting Plan (S4B, 2021b) (Appendix F57 in **Appendix F**).

13.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for noise, vibration and lighting in **Section 13.1** above, the potential impacts of the proposed redevelopment of the CBP relating to noise, vibration and lighting may be characterised as:

- Increased levels of light and noise as a result of the proposed design impact adversely on residential amenity in and adjacent to the precinct.
- Construction works cause excessive levels of noise and/or vibration and impact upon residential amenity in and adjacent to the precinct.
- Increases in residential and commercial activity lead to additional noise during operation, in and adjacent to the precinct.

These potential impacts are analysed in detail below.

13.4.1 Construction Noise

Construction noise levels from large construction sites are highly variable and are dependent on many factors, including changes in the timing of activities, changes in locations of the various mobile construction noise sources, acoustic shielding or reflections from structures such as buildings and local terrain.

Construction activities associated with development of the CBP are expected to require the following major noise-generating activities:

- Bulk earthworks
- Rock breaking
- Landscaping
- Road construction, and
- Water feature and parkland construction.

The Environment Protection Guidelines for Construction and Land Development in the ACT (ACT Environment Protection Authority, 2011) seeks to ensure that all building work that generates noise is conducted within the time periods detailed in Schedule 2 of the Environment Protection Regulation (EP Regulation) (2005).

Indicative noise levels from proposed construction activities at the CBP have been predicted using computer noise modelling (Umwelt, 2021a) (Appendix F19 in **Appendix F**) The actual sound power levels of noise sources to be used on site is unknown and will depend on the individual plant selected. Therefore, rather than predicting noise impacts from individual noise sources, the noise modelling predicted noise emissions from a fleet of combined plant and equipment which would typically be working together in close proximity while developing specific elements or stages of the precinct.

Based on the above, construction noise level contours have been predicted for nine construction scenarios (refer to Figures 3.2 to 3.10 of Appendix F19 in **Appendix F).** The predicted noise levels are the average of the noise impacts from construction works in the main areas of the precinct, based on the total typical (mid-point) sound power level of the construction fleet.

The modelling results shown in Figures 3.2 to 3.10 of Appendix F19 in **Appendix F** indicate the construction noise levels associated with the CBP redevelopment will not exceed the objectives of the ACT Environment Protection Guidelines for Construction and Land Development in the ACT (2011) if construction is undertaken during the hours specified in the EP Regulation, which for the Proposal would be 7.00 am to 6.00 pm Monday to Saturday.

The EP Regulation also requires the implementation of the noise and vibration mitigation recommendations of AS 2436 – Guide to noise and vibration control on construction, demolition and maintenance sites. Adoption of all noise mitigation recommendations in AS 2436 could achieve a substantial reduction in noise and vibration impact at receivers from construction activities. The mitigation measures from AS 2436 generally include:

- Adoption of universal work practices which minimise unnecessary noise and vibration.
- Community consultation/notification.
- Control of noise and vibration at the source through equipment selection and maintenance procedures.
- On-site noise mitigation including the use of noise barriers and distancing.
- Work scheduling and planning to undertake all possible work during hours that will minimise impacts to sensitive receivers.

In addition, where possible, the design of the CBP has been approached in such a manner as to maintain site topography to protect existing residential areas during the earthworks phase of development.

The Proposal will implement the mitigation measures from AS 2436 to ensure noise impacts are in accordance with the requirements of the EP Regulation.

13.4.2 Construction Vibration

Vibration impacts from construction activities depend on many factors including the:

- Size and power rating of the equipment causing the vibration
- Type of activity and utilisation of the equipment causing the vibration
- Distance between the source of vibration and the receiver, and
- Geology of the soil/rock through which the vibration is transmitted.

Due to the inherent variability of the above factors and other influences, it is generally not possible to accurately predict construction-based vibration levels for inclusion in an EIS or DA. However, the Construction Noise and Vibration Guideline (CNVG) published by Transport for NSW (TfNSW, 2016) contains information that may be used to provide assessment recommendations for the Proposal Area. The CNVG provides recommended minimum working distances between vibration generating plant and residential receivers. This is provided in Table 4.1 of Appendix F19 in **Appendix F**. The Proposal would implement these minimum working distances through the preparation of a noise management plan (NMP).

It is also recognised that heritage structures may have special requirements relating to vibration to protect the structures from damage. There are no criteria provided in ACT legislation or guidelines regarding the protection of heritage structures from vibration due to construction and/or operation of nearby developments. In NSW, the criteria given in the German Standard DIN 4150-3 are commonly used for protection of heritage structures (Umwelt, 2021a). However, the criteria given in DIN 4150-3 are primarily intended for assessment of heritage residential buildings in European countries, which may be significantly more sensitive to damage from vibration than the former industrial buildings in the heritage precinct within the Proposal Area.

As such, the Proponent would engage, prior to construction, a suitably qualified Structural Engineer to develop a site-specific set of vibration criteria for the heritage structures within the CBP.

13.4.3 Operational Noise

Noise arising from the operation of the Proposal would be assessable under the EP Regulation during the development application phase. The receivers on land adjoining the Proposal Area are classified as zone G in the EP Regulation Schedule 2.

It is anticipated that, once operational, the proposed residential development will not substantially alter the existing ambient environment, as it will be consistent with existing surrounding land uses. Noise standards specified under the EP Regulation do not apply to normal human or typical domestic noise. Noise from the operation of the CBP that is not otherwise permitted by the EP Regulation would be required to comply with the Noise Standards (Table 2.2 of the EP Regulation). Noise sources that may fall within the category of operational noise could include:

- Water pumping noise associated with the water feature.
- Water falling noise from a fountain (if any) operating within the water feature.
- Garden or grounds maintenance activities.

As noted within the Noise Impact Assessment (Umwelt, 2021a) (Appendix F19 in **Appendix F**), no environmental harm is considered to be imposed by these activities if they comply with the conditions of the EP Regulations Schedule 2, Table 2.3, Column 3. An OEMP will be prepared for the Proposal to ensure compliance with these conditions.

It is also noted that the provision of commercial and mixed uses within the Proposal Area may result in potentially noisy uses, as described within the Commercial Zones Development Code of the Territory Plan:

a) club

b) drink establishment

c) emergency services facility

d) hotel

e) indoor recreation facility

f) industry (except light industry)

g) indoor entertainment facility

h) outdoor recreation facility

i) restaurant.

The nearest existing residential property to the proposed commercial hub for the CBP, the heritage core, is approximately 130 m. This is the distance from the south-eastern edge of the heritage core to the existing property fence. The distance between this property and any noise-generating commercial space (e.g., café as opposed to office space or wellness centre) is more likely to be approximately 200 m.

The Proposal has sought to limit any noise impacts to the existing surrounding residential area through the provision of vegetated urban parkland to the east of the heritage core. The operation of the proposed commercial spaces would be subject to separate DAs and would require NMPs that demonstrate how the use would be consistent with the EP Regulation Noise Standards. It will ultimately be the responsibility of all commercial operators within the CBP to demonstrate compliance with the relevant noise operation standards for their particular business.

The Proponent commits to the preparation of NMPs, which would assess the potential impacts to surrounding residential areas and their management, for each subsequent DA they submit for the CBP. Appropriate management measures, such as noise walls or additional individual building design features, would be implemented in order to minimise potential noise impacts to the surrounding residential areas. These measures would then be incorporated into the OEMP for the overall operational management of the Proposal Area.

13.4.4 Lighting Impacts

Construction lighting at the CBP outside normal construction hours would be inward facing to prevent anti-social behaviour only. No lighting would be directed externally to the site, therefore external ambient light impacts would be limited to diffusion and indirect illumination. It is expected that impacts on surrounding residents would be minimal.

Once operational, the CBP will utilise similar levels of lighting to any residential/commercial area in line with Australian Standards and would include street lighting, pathway lighting within recreational and communal areas, and landscape feature lighting (refer to Appendix F57 in **Appendix F**). No lighting will be installed at the proposed tennis courts in order to minimise impacts to surrounding residential properties. Lighting in recreational areas would be managed through the implementation of an OEMP. Lighting in recreational areas is recommended to implement CPTED principles (refer to **Section 11.4.3**), however, impacts to surrounding residents would be minimised through considered brightness and placement. This would be further investigated during the DA stage of the Proposal.

The Proposal will be seeking to achieve 5 stars under Green Star Communities v1.1 rating tool. The Green Star Communities tool assesses Communities scale developments based on four categories, namely Governance, Liveability, Economic Prosperity and Environment. It also recognises and encourages the adoption of innovative technologies and programs that foster market transformation towards a sustainable building. ARUP was commissioned by Bloc to provide a high-level assessment of the current Yarralumla Brickworks Masterplan to achieve a 5 stars rating (ARUP, 2021a).

13.5 Proposed Mitigation Measures

The proposed mitigation measures for the Proposal aim to address the categories of impacts described in **Section 13.4**. As the impacts are interrelated, many of the measures contribute towards mitigating several impacts.

The Proposal has been designed with consideration for potential noise and lighting impacts to surrounding properties:

- Providing urban parkland between commercial areas and nearby residential areas to buffer potential noise impacts, and
- Ensuring adequate landscaping along property boundaries is included within the design to act as a natural barrier.

Noise and vibration mitigation measures for the construction phase would be formalised within a NMP that meets ACT residential and commercial noise requirements, to be prepared as a sub-plan to the CEMP. This would provide detailed management measures to assist in reducing the temporary impacts associated with construction.

In accordance with the Noise Impact Assessment (refer to Appendix F19 in **Appendix F**), site-specific vibration criteria would be developed for the heritage structures in the Proposal Area. These site-specific vibration criteria would be derived and recommended by a suitably qualified Structural Engineer prior to commencement of construction.

General measures that the Proponent commits to are:

- Implementing measures contained within AS 2436.
- Identifying sensitive receptors prior to construction commencing.
- Undertaking construction activities during standard construction hours.

- Where out-of-hours construction work is to be undertaken, ensuring surrounding residents are provided with at least 48 hours' notice prior to commencing out-of-hours work.
- Ensuring the community is informed of proposed works during consultation so they understand when noisy works would be occurring.
- Using modern, well serviced machinery with appropriate mufflers.
- Maintaining plant and equipment in accordance with manufacturers' recommendations and best practice throughout construction.
- Using inward facing site lighting during construction to prevent anti-social behaviour only.

Once operational, it is anticipated that the proposed residential development is unlikely to exceed the noise standards for the area. Noise impacts to the existing surrounding residential area from the operation of commercial uses would be minimised through the provision of vegetated urban parkland to the east of the heritage core and allowance for adequate landscaping along property boundaries. In addition, NMPs would be prepared for the various commercial uses proposed throughout the site, and these would be subject to separate DAs and noise impact assessments. All NMPs prepared for the Proposal Area would be consistent with the Guidelines for the Preparation of Noise Management Plans for Development Applications (ACT EPA, 2021).

No lighting will be installed at the proposed tennis courts in order to minimise impacts to surrounding residential properties, and operational lighting impacts to surrounding residents would be minimised through best practice lighting design, such as minimising direct light sources and spill.

13.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
N1	Provide urban parkland between commercial areas and nearby residential areas to buffer potential noise impacts. Ensure adequate landscaping along property boundaries is included within the design to act as a natural barrier.	1-remote	3-moderate	L	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Construction					
N2	Develop and implement industry best practice CEMP. Implement measures contained within AS 2436. Use modern, well service machinery with appropriate mufflers. Maintain plant and equipment in accordance with manufacturers recommendations and best practice throughout construction.	3-possible	2-minor	W	Yes
N3	Develop and implement industry best practice CEMP which includes a noise and vibration management plan. Identify sensitive receptors prior to construction commencing. Undertake construction activities during standard construction hours throughout the construction phase. Where out-of-hours construction work is to be undertake, ensure surrounding residents are provided with at least 48 hours' notice prior to commencing out-of-hours work. Maintain plant and equipment in accordance with manufacturers recommendations and best practice throughout construction. Site lighting during construction would be inward facing to prevent anti-social behaviour only.	2-unlikely	4-major	M	Yes
Operation					
N4	Develop NMPs during the DA phase that meet ACT residential and commercial noise requirements. Design the Proposal with consideration for potential noise and lighting impacts to surrounding properties. No lighting is to be installed at the proposed tennis courts and operational lighting impacts to surrounding residents are to be minimised through considered brightness and placement during detailed design.	2-unlikely	3-moderate	W	Yes

A medium residual risk of impact associated with construction noise remains for the Proposal. However, this risk is likely to reduce through the development and implementation of a construction NMP, to be incorporated into the CEMP. Additionally, these potential noise impacts would be temporary and limited to the construction period. This is further discussed in **Section 20.0** of this EIS.

All other noise, vibration, and lighting related-risks, particularly those relating to the operation of the Proposal, would be sufficiently managed through appropriate NMPs.

14.0 Hazard and Risk

Section Summary
This Section provides a summary of hazard and risk to the site and future residents as a result of bushfire within, or in the area surrounding, the CBP.

14.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
R1	Proposed bushfire mitigation measures (e.g., inner asset protection zones) are not adequately managed, both within the CBP and on adjacent land over the life of the Proposal, increasing the bushfire risk to residents.	2-unlikely	5-catastrophic	H	No
Construction					
R2	Loss of life and property resulting from construction fire.	2-unlikely	5-catastrophic	H	No
R3	Loss of life and property resulting from inadequate response to construction fire.	2-unlikely	5-catastrophic	H	No
Operation					
R4	Fire hazard management conducted at an inappropriate interval and intensity leading to increased risk to residents	2-unlikely	5-catastrophic	H	No

14.2 Existing Conditions and Values

The following sections on existing site conditions are adapted from the Bushfire Risk Assessment, Yarralumla Brickworks Precinct prepared by Australian Bushfire Protection Planners Pty Ltd (ABPP) (2020) (Appendix F20 in **Appendix F**).

14.2.1 Weather and Climate

The ACT has a relatively dry, continental climate with warm to hot summers and cool to cold winters. The average annual rainfall is 629 mm with an average of 108 rain days per year. Rainfall is reasonably evenly distributed throughout the year with the wettest month being October and the driest being June. January is the hottest month with a mean daily maximum temperature of 27°C and an average of 10 days of 30°C or more with 2 days of 35°C or more.

The fire season in the ACT corresponds with the summer months' high temperatures and low rainfall and can occur from September to April with a proclaimed bushfire danger period from October to March. There is significant variability from year to year. Fire seasons may be serious in three out of every 15 years, but this can vary considerably.

Canberra generally is not very windy with, on average, 25 days of strong winds a year. Late winter/spring tends to be the windiest time with just over half of these days (13 days) occurring in the four months between August and November.

Wind is an important factor in bushfire behaviour as it influences the rate of spread of the fire front and propagates embers/sparks, providing ignition sources for spot fires ahead of the main fire front. The CBP has an exposure to hot and dry south-westerly wind influences. These winds can spread embers from both small and large fires over long distances and ignite cured fuels ahead of the main fire front. Fires that occur in the unmanaged vegetation to the south-east of the site within Block 3 Section 94 have the potential to spread towards the site under the influence of south-easterly winds.

Climate change is also an important factor influencing the frequency of bushfires. This is assessed separately in **Section 12.4.3**.

14.2.2 Land Use

Except for the former Yarralumla Brickworks complex on Block 764 Section 102 Yarralumla, the development precinct contains vacant land. The land to the north, north-east and east of the CBP contains existing residential development. The land to the immediate west is vacant land zoned PRZ2 – Restricted Access Recreation while the land further to the west contains the Royal Canberra Golf Club. The land to the south-west is also vacant land zoned PRZ2 – Restricted Access Recreation while beyond that the Dunrossil Drive corridor, which leads to Government House, is identified as a Designated Area on the ACT Territory Plan. The land to the south-east and south of the development precinct is vacant land zoned PRZ2 – Restricted Access Recreation (refer to **Figure 2.1**).

Land use and associated land management practices affect the level of fuel available in an environment, which is a critical element in bushfire risk management. The CBP is exposed to the direct risk of a fire occurring in the unmanaged woodland vegetation within the PRZ2 zoned land to the south-east, within Block 3 Section 94.

The CBP is also exposed to the indirect risk from a fire that occurs in the grassy woodland vegetation on the North Curtin Horse Paddock, located to the south and south-west of the Cotter Road corridor. The Bushfire Operations Plan (BOP) for the North Curtin Horse Paddocks identifies that fuel management by grazing would only occur within the southern portion of the Horse Paddock precinct, leaving the remainder of the precinct unmanaged for fuel reduction (during the period 2015/2018). In addition, there always remains the likelihood that circumstances may prevail when the grassy woodland vegetation within the Horse Paddocks has not or cannot be managed to mitigate the bushfire risk.

14.2.3 Topography

Slope is a critically important factor when assessing fire risk and likely fire behaviour. The rate of fire propagation doubles up a slope of 18% and increases almost fourfold up a slope of 40% (ABPP, 2020).

The landform within CBP is gently undulating with a fall to the west and south-west of less than 10%. The land beyond the precinct falls to the north-west at less than 10% across the Royal Canberra Golf Club and the Dunrossil Drive corridor, rising to the west beyond the Dunrossil Drive corridor. The land within the North Curtin Horse Paddock to the south-west of Cotter Road falls to the south and south-west at less than 10% into Yarralumla Creek, providing an upslope fire path from the south-west.

Similarly, land within Block 3 Section 94 to the south-east of the southern portion of the CBP provides a potential upslope fire path from the south-east albeit at a lower slope.

14.2.4 Vegetation

The vegetation within the Proposal Area and surrounding area is described in terms of biodiversity and landscape value in **Section 16.2**. The following section describes the vegetation from a bushfire management perspective.

Much of the vegetation on the CBP site is to be cleared as part of the Proposal. The vegetation within the adjoining residential development to the north, north-east and east of CBP consists of managed landscaped gardens which do not constitute bushfire prone vegetation.

To the south-east of the CBP within Block 3, Section 94 (between Cotter Road and Denman Street) the vegetation consists of large copses of planted woodland separated by managed grassland. This vegetation type also occupies the land between the east and west-bound lanes of Cotter Road.

The PRZ2 zoned land to the west and south-west of the CBP (within Block 1, Section 127) contains mature Monterey pines with a dense weed infested understorey.

The Royal Canberra Golf Club, to the west and north-west of the CBP, contains mown lawns and managed grass (which is irrigated) beneath a canopy of Monterey pine trees. This vegetation is not currently deemed to be bushfire prone vegetation.

The Dunrossil Drive corridor is currently undergoing replanting. Once complete, the vegetation would consist of a central avenue of elm trees, surrounded by a second avenue of mixed trees (pine and oak) with a third outer avenue of evergreen species of oak followed by a pine plantation on the outside. The latest version of the National Capital Bushfire Operations Plan (June 2018) identifies that the vegetation within the Dunrossil Drive corridor would continue to be regularly managed (slashed) and the Royal Canberra Golf Club fairways, located to the south-west of the Dunrossil Drive corridor, would also contain managed vegetation. The vegetation in these areas is therefore not deemed to be bushfire prone.

The North Curtin Horse Paddock, located to the south-west of Cotter Road, contains grassland with scattered woodland shade trees which relies on grazing for management. The grassland vegetation within the Cotter Road reserve and on Section 94, to the south and south-east of the CBP is managed by slashing. The ESA Bushfire Operations Plan also shows that slashing also extends into the southern portion of the CBP.

Review of the ESA Bushfire Prone Land Map has identified that the only vegetation which is deemed to present a direct bushfire hazard to the CBP is the:

- weed infested Monterey pine vegetation within the PRZ2 zoned land to the west and south-west
- retained vegetation in the narrow corridor of PRZ2 land to the south (within Block 1, Section 127)
- copses of retained vegetation within Block 3 Section 94, to the south-east of the CBP
- grassy woodland within the Horse Paddock precinct.

14.2.5 Environmentally Sensitive Land

Ecological investigations have identified the presence of the previously critically endangered, now vulnerable, golden sun moth within the Proposal Area. This is further discussed in **Section 16.0**.

Ecological studies have also identified the possibility that the northern portion of the North Curtin Horse Paddock precinct and the land to the south and east of the development precinct may contain suitable habitat for golden sun moth.

Whilst the presence of potential or actual golden sun moth habitat does not exclude management of the grassland vegetation to reduce the fuel hazard, it does restrict the potential for management of the vegetation to provide a low level of bushfire hazard.

14.3 Investigations

ABPP was commissioned by the LDA in 2014 to prepare a Bushfire Risk Assessment (BRA) that determined the level of bushfire risk, and the protection measures required to mitigate the risk to the proposed redevelopment of the CBP.

The final ABPP report (Reference B142415, dated 29 January 2016) found that a high bushfire risk to CBP may occur as a result of a fire in the following locations, prior to the implementation of bushfire protection measures:

- Monterey pine vegetation to the west
- Vegetation within the North Curtin Horse Paddock (southwest of Cotter Road), and
- Woodland vegetation in the PRZ2 Zoned land to the south-east.

The report provided recommendations on the measures required to be implemented to mitigate the potential bushfire risk to future residential development on the site.

In April 2020, ABPP prepared an updated BRA (Appendix F20 in **Appendix F**) based on a review of the Concept Estate Development Plan – Concept Masterplan to provide recommendations on measures required to be implemented to comply with the Strategic Bushfire Management Plan for the ACT (ESA, 2014). The objectives of the updated report were to:

- Identify the level of risk to the future development within the site in accordance with best practice bushfire risk management, the requirements of any relevant Australian Standards and the ESA 2014 Plan and recommendations.
- Identify how levels of risk can be mitigated.

The preliminary assessment of the risk to the CBP was undertaken during a site inspection by ABPP. The 2020 report was subsequently referred to the ESA. Following receipt of feedback and a meeting between Deed Management; Parks & Conservation ACT Fire & Rescue; ACT Rural Fire Service; Statutory Planning; the SLA and the Proponent, a resolution was reached on the provision of bushfire protection measures to be established to the south-east of Precinct 7 and Precinct 9 of the Proposal Area. These measures are based on the provision (and management) of an Outer Asset Protection Zone (OAPZ) on the land immediately adjoining the south-eastern boundary of the Proposal Area.

ABPP subsequently prepared a supplementary BRA (Reference B203479-3 issued 04 August 2021) (Appendix F47 in **Appendix F**) to reflect this change in the Proposal's Masterplan.

14.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for bushfire hazards in **Section 14.1** above, the potential impacts of the proposed redevelopment of the CBP relating to bushfire hazards may be characterised as:

- Increased risk of bushfire to residents on site and in surrounding areas due to poor hazard management.
- Potential fires during construction caused by machinery sparks or other on-site sources e.g. welding.

These potential impacts are analysed in detail below.

14.4.1 Increased Bushfire Risk

The BRA (2020) identified that the retained vegetation within the PRZ2 zoned land to the west, south-west and south, within Block 1 Section 127, and to the south-east in Block 3, Section 94, presented a moderate risk to the Proposal if it remained unmanaged. However, the vegetation within Block 1 Section 127, and to the west, south-west and south would be removed and managed as parkland, extending the existing management protocols to the west of the Proposal along the western, south-western, and southern edges of the CBP. Continued management of the vegetation within the Royal Canberra Golf Club land, the Dunrossil Avenue corridor and the land within Block 1 Section 127 removes the risk of bushfire to CBP from the north-west, west and south-west directions.

The ESA has advised that the small area of vegetation to the south-east of the Proposal area in Block 3, Section 94 can be assessed as 'remnant forest' for the purpose of determining the width of an Inner Asset Protection Zone to Precincts 7 and 9, and for determining the required level of bushfire construction to the proposed buildings (ABPP, 2021). This categorisation is permitted subject to the establishment and management of the Outer Asset Protection Zone (OAPZ) along the south-western side of Denman Street. The Proponent can confirm that adjacent landholders agree to this OAPZ, and that ongoing consultation will be carried out in order to develop an ongoing strategy for its management.

The ESA has also advised that an edge (perimeter) road between the hazard and the buildings in Precinct 7 and Precinct 9 is required and that the perimeter road is to have a width of 7.5 metres, kerb to kerb and be constructed in accordance with the performance criteria of Table 10 of the ACT Bushfire Management Standards (ACT Government, 2014). The Proponent subsequently revised the Masterplan (refer to **Section 2.8.3**) and commits to the provision of these Outer and Inner Asset Protection Zones, to be established and maintained in accordance with the ACT Strategic Bushfire Management Plan. At a broader scale, unmanaged grassland vegetation within the North Curtin Horse Paddock, located to the south-west of Cotter Road (beyond the Royal Canberra Golf Club), presents an indirect risk to the development precinct from ember attack.

The BRA addressed the potential impact of unplanned fire events in the North Curtin Horse Paddock and Block 3 Section 94 by examining:

- Fire history
- Exposure to possible ignition/fire sources
- Vegetation type and likely fuel loads
- The impact of climate
- Wind effects, and
- The impact of surrounding land uses and fuel loads.

Table 14.1 provides a statement of risk for the potential fire scenario that may impact the CBP prior to mitigation measures being adopted/implemented (ABPP, 2020) (Appendix F20 in **Appendix F**).

Table 14.1 Bushfire Risk Register

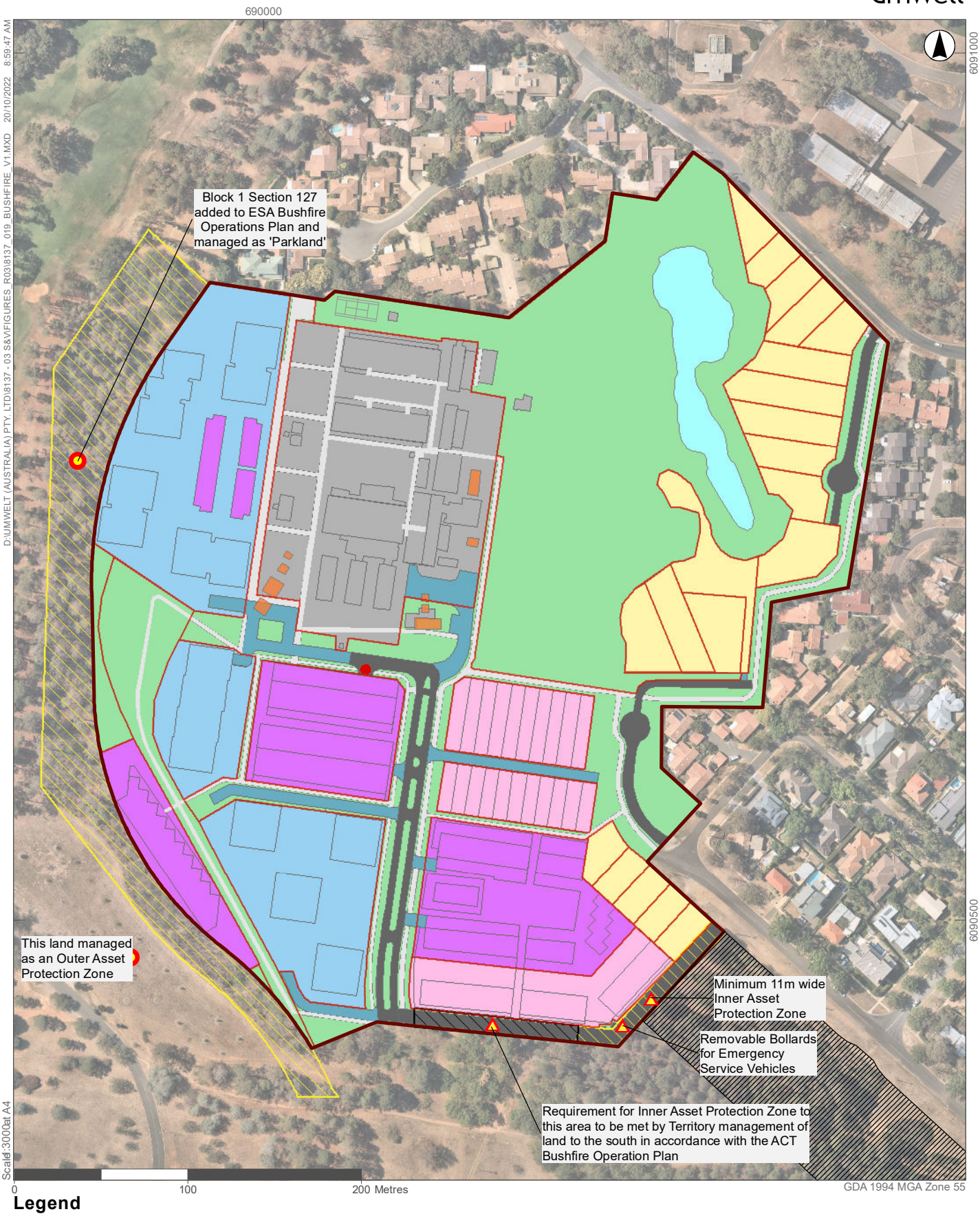
Risk	Consequence	Likelihood	Level of Risk	Risk Priority
Fire burning in the grassy woodland vegetation on the North Curtin Horse Paddocks to the south-west of the Cotter Road corridor, spreading under south-west winds	Moderate 3	Possible – may occur during severe fire danger periods C	High	1
Fire burning in the grassland/woodland vegetation to the south/south-east of the development precinct, spreading under south-east winds	Minor 2	Unlikely to occur during sever fire danger periods D	Low	2

The ACT Strategic Bushfire Management Plan 2014 requires the provision of an Outer and Inner Asset Protection Zone to the south-western edge of the Proposal. The management of the Dunrossil Avenue and Cotter Road corridors satisfies the requirement for an Outer Asset Protection Zone, provided that the current management practices remain in place.

An 11 m-wide Inner Asset Protection Zone (IAPZ) will also be provided to the southern and south-eastern aspect of the Proposal, located inside the property boundary (refer to **Figure 14.1**). A 7.5 m-wide perimeter road will also be provided along the south-eastern boundary of the Proposal Area.

The construction of buildings located within the 100 m-wide setback to unmanaged bushfire prone vegetation will comply with the relevant Australian Standards. The internal road network would also be designed and constructed to ACT Fire Brigade (Fire & Rescue ACT) standards so as to allow heavy emergency service vehicles to manoeuvre quickly and efficiently in both response and normal operating modes.

The BRA concluded that through the provision and maintenance of fire protection measures, the potential bushfire risk is reduced.



Legend

- Proposal Area
- Apartment Typology
- Heritage Precinct
- Single Dwelling Block with Community Title Scheme
- Single Dwelling Lots
- Terrace Typology
- Open Space
- Water
- Community Title Road / Driveway
- Public Carpark Entry
- Public Roads
- Shared/Footpath
- Structures to be Demolished
- Asset Protection Zone
- Outer Asset Protection Zone

FIGURE 14.1

Plan of indicative widths of Asset Protection Zones (ABPP, 2020)

Image Source: Nearmap (Jan 2020) **Data source:** Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2020)

14.4.2 Fires During Construction

There is always a risk of fire occurring during construction. Key ignition sources that often cause construction fires include:

- Hot works, including:
    - Cutting and grinding
    - Welding, brazing and soldering
    - Thermal spraying
    - Use of oxyacetylene torch or blow torch
    - Installation of heat-applied materials.
- Electrical supplies and equipment
- Smoking materials
- Open fires/waste fires, and
- Plant equipment and vehicles.

Controlling these ignition sources would be a primary mitigation measure for reducing the risk of fire during construction. Extinguishers would be made available on site throughout construction and a fire response protocol would be included in the CEMP.

It is considered that the risk of fires occurring during construction can be sufficiently managed through the preparation and implementation of a CEMP. This is further discussed below in **Section 14.5**.

14.5 Proposed Mitigation Measures

The ACT Strategic Bushfire Management Plan (2014) provides recommendations on the provision of APZ to development located in a bushfire prone area and which is likely to be subject to bushfire attack. An IAPZ and OAPZ are proposed as part of the Proposal. This is demonstrated in **Figure 14.1** above, and further discussed in Appendix F20 and Appendix F47 in **Appendix F**.

Other mitigation measures and recommendations include:

- **Collaboration with adjacent land users** – consultation with surrounding land users, such as the Royal Canberra Golf Club and ACT Government to develop an agreement for the management of IAPZ that fall outside the Proposal Area over the life of the Proposal. It is noted that these areas are already maintained for bushfire purposes and have received in-principle support from the relevant land custodians.
- **Water Supplies for Fire-fighting Operations** – Hydrants for fire-fighting operations are to be provided along the perimeter road to the satisfaction of Fire and Rescue ACT. The hydrant supply shall be installed to comply with the agreed standards for water supply and require type F5 standard 45 L/s single standard hydrants at 60-metre intervals to the hazard interface.

- **Management of Pocket Parks and Open Space Areas** – The pocket parks within CBP shall be maintained to the prescriptions of an IAPZ as defined by the ACT Strategic Bushfire Management Plan (2014). Management shall also comply with the 'Low Threat Vegetation' as defined by Section 2.2.3.2 of AS 3959-2009.
- **Prepare a bushfire management plan** – A bushfire management plan is to be prepared and implemented as part of the EDP and OEMP to ensure ongoing management of both the IAPZ and OAPZ, including details as to the frequency and intensity of fire hazard management throughout operation of the site.

The following mitigation measures would be incorporated into the site CEMP to mitigate bushfire risks during the construction phase of the redevelopment:

- Implement an approved bushfire hazard management plan.
- Include a fire response plan within the CEMP.
- Ensure all personnel on site are advised of fire response protocols and emergency exit procedures during site inductions.
- Maintain plant and equipment in accordance with manufacturers' recommendations and best practice.
- Observe seasonal and daily fire hazard warnings issued by the ACT ESA.
- Cease all works that could emit a spark (hot works including cutting, welding, grinding, rock excavation etc) under a declared Total Fire Ban.
- Keep vehicles on formed roads and paths, away from long grass where possible.
- Provide appropriate parking areas for personnel that are away from long grass and other ignition sources.
- Apply smoking restrictions throughout the construction site, providing designated smoking areas.
- Avoid unnecessary idling of vehicles.
- Ensure fire extinguishers are available in all construction site compound buildings.

By adopting the recommendations of the BRA and incorporating fire management measures into the CEMP and OEMP, including maintaining the inner asset protection zones in accordance with the ACT Strategic Bushfire Management Plan, it is expected that the risk of fire occurring within the Proposal, either during construction or operation, is reduced as much as reasonably practicable.

The application of these management measures against the risks identified in **Section 14.1** and the associated residual risks are outlined in **Section 14.6** below.

14.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
R1	Apply regulated asset protection zones to the CBP and incorporate during design phase. Collaborate with the adjacent land users (i.e. ACT Government or the Royal Canberra Golf Club) to develop an agreement for the management of IAPZ that fall outside the CBP over the life of the Proposal. Parks within the Proposal are to be maintained to the prescriptions of an IAPZ as defined by the ACT Strategic Bushfire Management Plan (2014). Management is also to comply with the 'Low Threat Vegetation' as defined by Section 2.2.3.2 of AS 3959-2009. Prepare a bushfire management plan to manage asset protection zones.	1-remote	5-catastrophic	M	Yes
Construction					
R2	Develop and implement industry best practice CEMP prior to construction works commencing. Implement an approved bushfire hazard management plan during construction. Maintain plant and equipment in accordance with manufacturers' recommendations and best practice. Observe seasonal and daily fire hazard warnings issued by the ACT ESA. Cease all works that could emit a spark (hot works including cutting, welding, grinding, rock excavation etc) under a declared Total Fire Ban Keep vehicles on formed roads and paths, away from long grass where possible. Provide appropriate parking areas for personnel that are away from long grass and other ignition sources. Apply smoking restrictions throughout the construction site, providing designated smoking areas. Avoid unnecessary idling of vehicles.	1-remote	5-catastrophic	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
R3	Include a fire response plan within the CEMP. Ensure all personnel on site are advised of fire response protocols and emergency exit procedures during site inductions. Ensure fire extinguishers are available in all construction site compound buildings.	1-remote	5-catastrophic	M	Yes
Operation					
R4	Maintain inner asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Develop and implement an industry best practice bushfire management plan as part of the OEMP including details as to the frequency and intensity of fire hazard management throughout operation of the site.	1-remote	5-catastrophic	M	Yes

It is apparent that, even with mitigation, the residual risk of impacts associated with fire remains as medium. This is attributed to the potentially catastrophic consequences inherent to fire events. However, it is considered that the Proposal has, and would continue to, seek to reduce this risk as far as is reasonably practicable, through the mitigation measures proposed. This is further discussed in **Section 20.0** of this EIS.

15.0 Soils and Geology

Section Summary
This Section provides an assessment of the potential impacts of the Proposal to the soil and geology of the area. In particular, this section considers potential construction impacts to the Yarralumla Formation. Risks associated with soil contamination were also identified but are discussed separately in **Section 18.0**.

15.1 Preliminary Risk Assessment

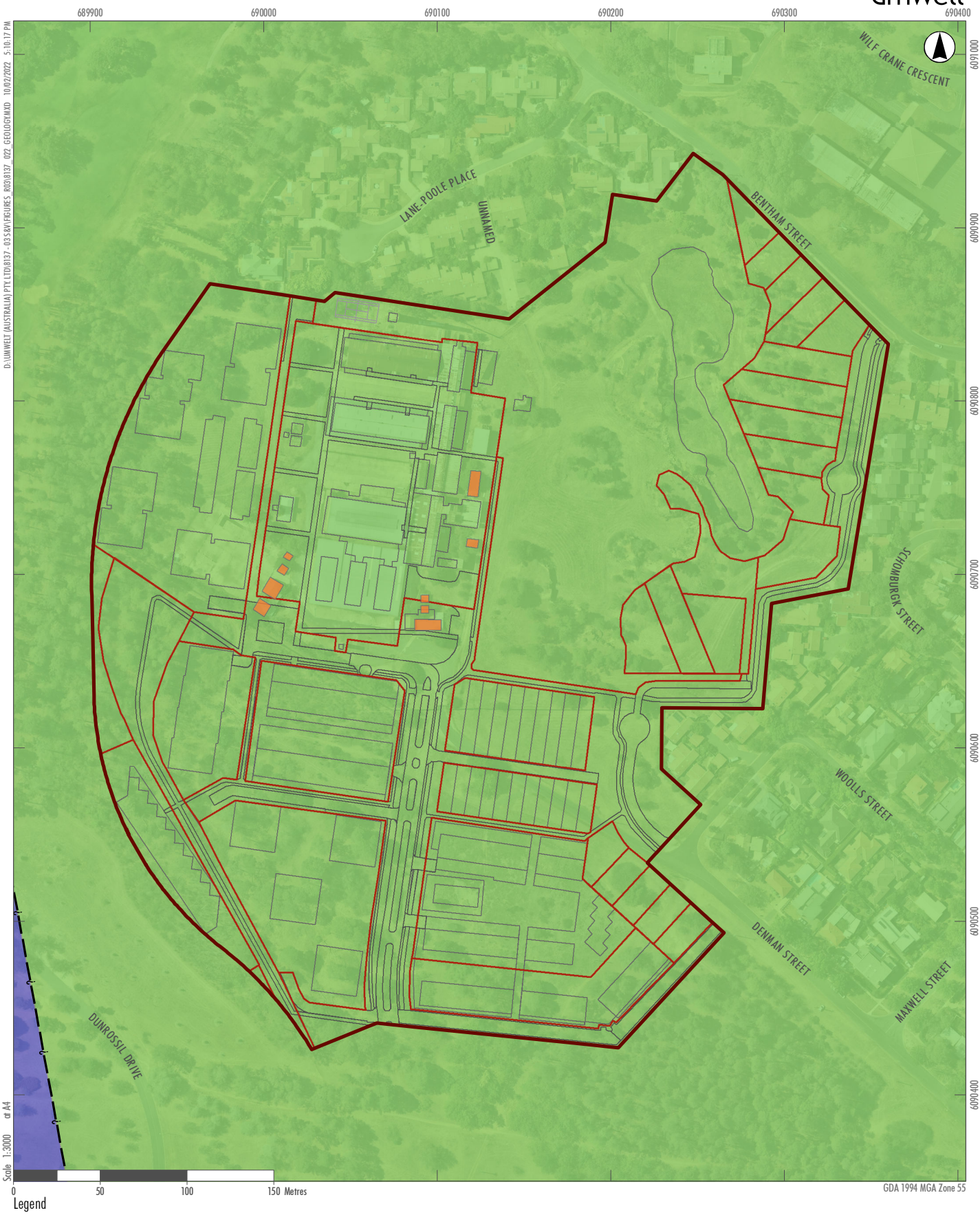
No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
G1	Subsurface conditions that may impact construction activities not identified and inappropriate design concepts developed as a result.	3-possible	4-major	H	No
Construction					
G2	Soil disturbance and imported fill leads to adverse impacts, such as erosion and dispersion (air and waterways).	4-likely	2-minor	M	No
G3	Widespread use of fill across the site results in the destabilisation/lack of density/compaction necessary for construction.	3-possible	3-moderate	M	No
Operation					
G4	Subsurface conditions that may result in long-term impacts to new development, such as erosion and sedimentation, and soil instability.	2-unlikely	4-major	M	No

15.2 Existing Conditions and Values

The topography of the Proposal Area is variable and has been significantly modified by quarrying and landfill. The Proposal Area ranges in elevation from approximately 570 m AHD to 590 m AHD, and generally slopes to the west towards the Royal Canberra Golf Club and north-west. A small portion of the Proposal Area, towards Dudley Street, slopes to the south and south-west.

15.2.1 Geology

Reference to the 1:100,000 geological map of Canberra indicates that most of the Proposal Area is underlain by the Yarralumla Formation (refer to **Figure 15.1**), the only fossiliferous marine unit within the extensive volcanic marker horizons of South Canberra (SMEC, 2013) (Appendix F22 in **Appendix F**).
The formation exists between two layers of volcanic soil – the Mount Painter Volcanics below and the pyroclastics from the Deakin Volcanics above. The Deakin Volcanics, consisting of Rhyodacitic ignimbrite and minor volcaniclastic and argillaceous sediments, occur in close proximity to the Proposal Area.



Legend

- Proposal Area
- Structures to be Demolished
- ?Geological Fault

Geology (Canberra 1:100 000 Geological Map)

- LAIDLAW VOLCANIC SUITE//Yarralumla Formation/ - calcareous and tuffaceous mudstone and siltstone with minor limestone, calc-silicate hornfels and quartz sandstone
- HAWKINS VOLCANIC SUITE//Mount Painter Volcanics/ - dacitic ignimbrite with lithic xenoliths and dacitic autoliths, minor tuff and ashstone

FIGURE 15.1

Geology

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory;

The formation extends from Red Hill and Woden in the south to Yarralumla and Lake Burley Griffin in the north. The formation consists of calcareous and tuffaceous mudstone and siltstone with minor limestone, calc-silicate hornfels and quartz sandstone (SMEC, 2013) (Appendix F22 in **Appendix F**), dating back to the early Silurian age (424-423 million years ago).

Excavations at the quarry have exposed the Yarralumla Formation and the site is recognised as one of the only locations from which the Yarralumla Formation can be closely observed (SMEC, 2013) (Appendix F22 in **Appendix F**). The formation shows fossil evidence of trilobites, coral and primitive crinoids, and is evidence of the last major period when eastern Australia was still covered by shallow seas.

There are four specific locations in the quarry that demonstrate particular geological aspects of the site and the Yarralumla Formation (refer to **Figure 15.2**):

- A and D show excellent examples of anticline in calcareous siltstone. The siltstone can be seen to grade to sandstone from the inner strata to the outer.
- B shows a typical tuffaceous mudstone and siltstone of the Yarralumla Formation. The tuff is poorly cemented and consists of a fine-grained white clay matrix containing large fragments of siltstone.
- C shows abundant fossils of mainly brachiopods, trilobites, coral and crinoids preserved in a bedding plane. The quarry is one of the only locations in which the fossil contents of the Yarralumla Formation can be closely observed.

These geological features are included in the Yarralumla Brickworks citation on the ACT Heritage Register (refer to **Section 17.2.3**).

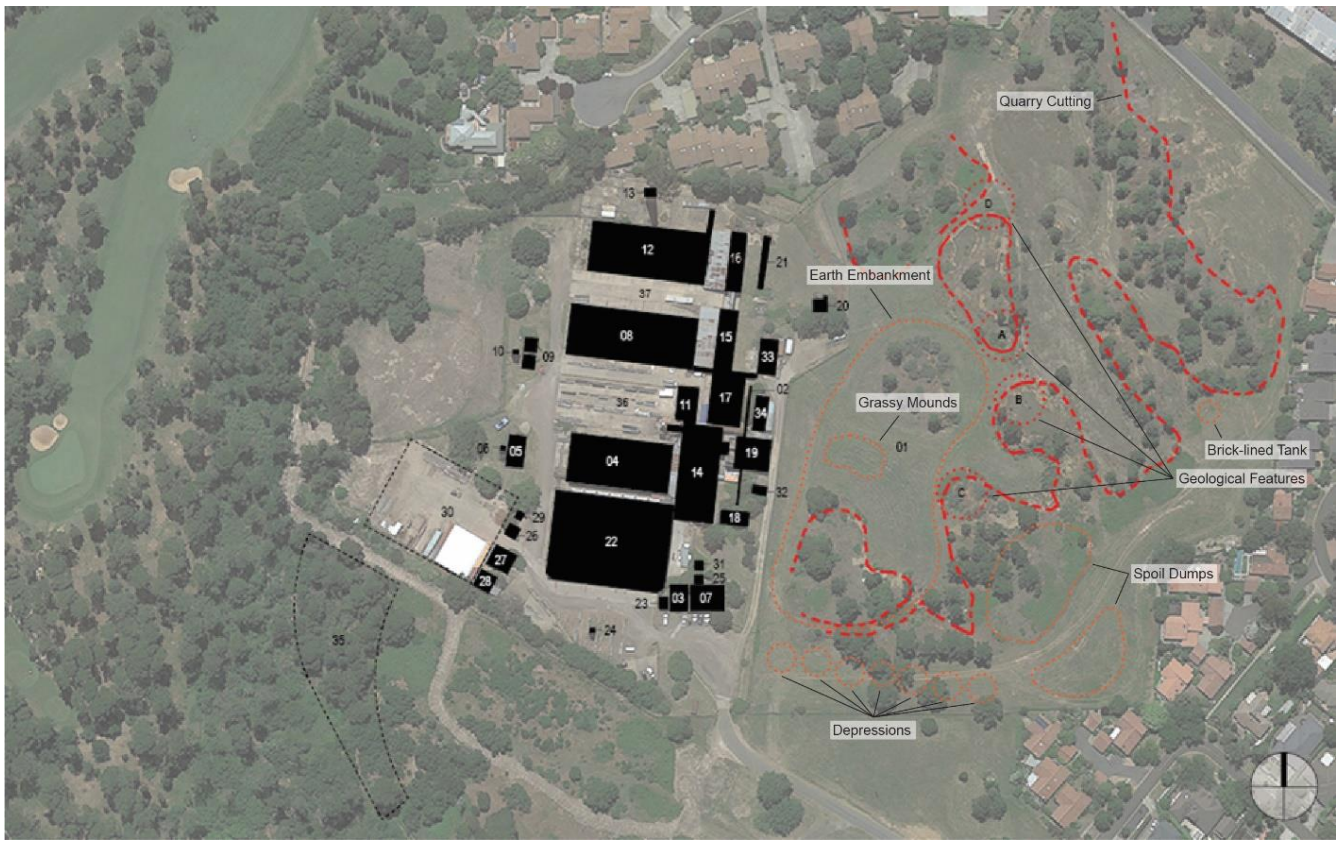


Figure 15.2 Geological features A-D (red)

Source: GML, 2021b.

An updated detailed geological assessment of the quarry was undertaken by ACT Geotechnical Engineers Pty Ltd in February 2021 (refer to Appendix F48 in **Appendix F**). The assessment concluded that there are no additional fossils of scientific value located in the area of the proposed works.

15.2.2 Soils

The Soil Landscapes of the Canberra 1:100,000 Sheet maps the soils of the Proposal Area as Williamsdale soil landscape, which is characterised by undulating rises and local relief, typically below 10% in natural terrain. Test pit data has identified that fill soil is approximately 2.5 to 3 m in depth (Robson Environmental, 2015) (Appendix F23 in **Appendix F**) overlying natural soils. The majority of the CBP is comprised of natural silty clays, underlain by siltstone, sandstone, or Dacite bedrock. In locations which have been historically disturbed, the soils have been modified due to the typically hard-setting, erodible and potentially dispersive soil (SMEC, 2013) (Appendix F22 in **Appendix F**).

Test pitting activities were undertaken within the CBP from in September 2013 (SMEC, 2013) (Appendix F22 in **Appendix F**). The subsurface conditions encountered are broadly consistent with data published on geological maps.

A significant portion of the CBP has been excavated to provide raw materials for brickmaking. Excess raw materials from the quarry have been mixed with brick offcuts to backfill parts of the quarry, and to create fill mounds around the site, possibly to divert water from the quarry. Robson Laboratories (2015) confirmed the presence of siltstone within the brickworks area and quarry. Siltstone was typically moderately to highly weathered, underlying silty clay and fill of varying depths. The nature of fill varied widely across the site, from high plasticity clay to gravels and slag. The limited nature of this investigation, together with the varying depth of the quarry and the inconsistent nature of fill mean that further investigation is required for the full delineation of fill areas.

15.3 Investigations

The following investigations have been considered with regard to impacts on soil and geology as a result of the Proposal:

- Preliminary Geotechnical Site Investigation for Canberra Brickworks (SMEC, 2013) (Appendix F22 in **Appendix F**) prepared for the LDA.
- Stage 1 Environmental Site Assessment Canberra Brickworks Remediation Project (Robson Environmental, 2015) (Appendix F23 in **Appendix F**) prepared for Capcorp Constructions Pty Ltd.
- Canberra Brickworks: Detailed Environmental and Geotechnical Site Investigation (SMEC, 2016a) (Appendix F21 in **Appendix F**) prepared for the LDA.
- Concept EDP – Environmental Management and Protection Plan (Sellick, 2022c) (Appendix F24 in **Appendix F**) prepared for Doma Group.
- Canberra Brickworks Development—Blocks 1, 7, and 20, Section 102, Yarralumla Backfilling of Old Quarry Area—Geotechnical Fossil Study (ACT Geotechnical Engineers Pty Ltd, 2021a) (Appendix F48 in **Appendix F**), prepared for Doma Group.
- Draft Canberra Brickworks Quarry: Statement of Heritage Effect (GML, 2021b) (Appendix F49 in **Appendix F**) prepared for Doma Group.
- Canberra Brickworks Redevelopment - Quarry Pit Backfilling Guidelines for construction of controlled fill (ACT Geotechnical Engineers Pty Ltd, 2021b) (Appendix F56 in **Appendix F**) prepared for BLOC.

Further detailed geotechnical assessments would be undertaken prior to construction.

Soil contamination is discussed in **Section 18.0**.

15.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for soils and geology in **Section 15.1** above, the potential impacts of the proposed redevelopment of the CBP relating to soils and geology may be characterised as:

- Erosion and sedimentation, and resultant instability impacts as a result of poor site management practices, both during construction and operation.
- Widespread use of fill across the site resulting in the destabilisation/lack of density/compaction necessary for construction.
- Impacts to the Yarralumla Formation.

These potential impacts are analysed in detail below. Impacts to the heritage significance of the Yarralumla Formation are discussed in **Section 17.0** of this EIS. Impacts associated with soil contamination are discussed in **Section 18.0.**

15.4.1 Erosion and Sedimentation

The Proposal has the potential to result in erosion and sedimentation impacts through the excavation and disturbance of soil on site. Without appropriate erosion and sediment control measures in place, large amounts of soil can be lost from a construction site and enter the stormwater system, which drains directly into waterways. Sediment in waterways pollutes creeks, lakes and rivers and has a major impact on water quality, aquatic plants and animals. Sediment pollution in stormwater is a major cause of environmental degradation in receiving waters. Soil can also be transported by wind; associated dust impacts are discussed in **Section 12.0** of this EIS.

There is potential for downslope impacts to occur from the quarry cliff, with sediment runoff flowing towards the Heritage Core. A sediment control fence and cut off drain would be installed to the east of the Heritage Core to prevent impacts from occurring. The fence would be checked and reinstated on a weekly basis during construction (Sellick, 2022c) (Appendix F24 in **Appendix F**).

The basement excavation and existing onsite pond would also act as sediment control ponds during construction. The existing onsite pond would be rehabilitated post construction and incorporated into the natural features of the site. If sediment is not properly removed from the pond after construction is complete there may be ongoing impacts to any aquatic plants and animals that are established. Regular dredging of these ponds would occur to ensure sediment build up is cleaned out. Water levels in sediment control ponds would be maintained at less than 20% of capacity to allow for adequate runoff storage during rain events.

A draft Environmental Management and Protection Plan (EMPP) has been prepared for the Proposal (refer to Appendix F24 in **Appendix F**). The EMPP demonstrates the location of the sediment control pond, location of stockpiles, sediment control fencing and cut off drains. This would be reviewed and revised throughout construction in line with the development and implementation of the CEMP. An Erosion and Sediment Control Plan (ESCP) would also be prepared prior to construction and included as a sub-plan to the CEMP to manage soil impacts during construction.

15.4.2 Geotechnical Issues

The Proposal Area has experienced substantial historical disturbance through the use of the site as a brickworks. This is demonstrated in the presence of fill material, consisting predominantly of bricks (whole and fragments), with lesser amounts of concrete (slabs and fragments), ash material, reworked soil, and trace amounts of metal pipe, found across the Proposal Area. The fill material encountered during geotechnical investigations ranged in thickness between 0.1 m to 3.3 m (SMEC, 2016a).

The fill material which was placed around the Proposal Area upon the closure of the operational brickworks is uncompacted, and prone to collapse upon disturbance. Therefore, removal of the fill is required to allow for redevelopment. Areas proposed to be developed adjacent to the quarry cliffs also require additional clean fill to create a level and stable surface for development.

ACT Geotechnical Engineers (2021b) (refer to Appendix F56 of **Appendix F**) has recommended a procedure for the controlled fill of the quarry, which the Proponent intends to adopt. The procedure is generally as follows:

1. Areas on the base and sides of the quarry pit would be fully stripped of any debris and moisture-affected soils, to expose in-situ weathered bedrock. As the sides of the quarry pit are quite steep, terraces would need to be cut into the sloping sides to enable proper compaction close to the sides of the old pit.

2. Soil foundations would be proof-rolled by a heavy vibratory pad-foot roller (preferably of not less than 9 tonne static mass) to check for any weak or wet areas that would require replacement. The proof-rolling would be viewed by a geotechnical engineer prior to placing fill (hold point).

3. Controlled fill comprising suitable on-site excavated or imported materials of not greater than 75 mm maximum particle size, to be compacted in not greater than 150 mm layers.

4. The fill material would be inspected by a geotechnical engineer for prior approval, and ideally comprise a low to medium plasticity sandy clay, gravelly sandy clay, clayey sand, gravelly clayey sand, or sandy clayey gravel, with a maximum particle size of 75 mm.

5. A geotechnical engineer would overview the fill placement (regular engineering inspections and Level 1 supervision), to ensure that correct compaction equipment/methods are employed and to check material properties and moisture content.

6. Field density testing would be carried out at a frequency of one test per 500 m.

7. Fill placement and control testing would be overviewed and certified by a geotechnical engineer at Level 1 involvement as per AS3798 - 1996 Guidelines on Earthworks for Commercial and Residential Developments.

8. Pad and/or strip footings for the new buildings, as well as ground slabs and access roads/driveways, would then be founded in the controlled fill. The site would be a Class “M" for slab and footing design (provided only low-reactive fill material is used).

9. The fill batters would be stabilised using ‘Geoweb’, meaning that the batters can be steepened to 1(H):1(V). These steeper slopes could be supported by retaining walls, gabions, crib walls, or similar.

The use of Geoweb is an effective and well-known method stabilisation technique within construction. It is considered that the Proponent has sufficiently considered stabilisation requirements for the Proposal.

Further discussion of impacts to the natural heritage of the site, including the Yarralumla Foundation, is contained in **Section 17.0**. **Figure 17.2** shows the areas of cut and fill in the north-east and east of the site near the geological formations.

Any potential contamination issues associated with fill materials will also be managed through the CEMP, RWP and SMP (refer to **Section 18.0**). This would include measures such as a stabilised construction entrance to be established prior to site access by construction vehicles.

15.4.3 Yarralumla Formation

As part of the Proposal, two areas of the quarry would be backfilled to allow for residential development (refer to **Figure 17.2**). This would involve up to six metres of fill being placed in these areas to return the surface to pre-quarry levels. This would result in burial of some of the exposed quarry faces. ACT Geotechnical Engineers Pty Ltd (2021a) investigated the proposed fill areas to determine whether the proposed backfilling would result in any adverse impacts to significant geological features within the Yarralumla formation, such as fossils.

The investigation did not find any fossils within the proposed fill areas. It was also noted that due to the presence of foliation, any fossils that did occur in these areas would now likely be destroyed or distorted. As such, any fossils that may be present are likely to have been degraded and of low scientific value. The investigation determined that there is no geological reason to prevent the filling from occurring (ACT Geotechnical Engineers Pty Ltd, 2021a).

However, as described above in **Section 15.2.1**, it has been reported that there are “abundant fossils preserved as molds on a bedding plane” at site C within the quarry (refer to **Figure 15.2**). As such, the area around site C will be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding will also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).

No impact to the geological significance of the Yarralumla Formation is expected as a result of the Proposal. Further discussion regarding potential impacts to the formation’s natural heritage significance is discussed in **Section 17.0**.

15.5 Proposed Mitigation Measures

Mitigation measures for the construction phase will be formalised within an ESCP, prepared as a sub-plan to the CEMP. This would provide detailed management measures to assist in reducing the temporary impacts associated with construction. The draft EMPP provides indicative locations for the sediment control pond, stockpiles, sediment control fencing and cut off drains likely to be used for the Proposal. General measures that the Proponent commits to within the CEMP are:

- Sediment and erosion control devices are to be installed in accordance with Environment Protection Guidelines for Construction and Land Development in the ACT (Environment Protection Authority March 2011) and fully operational prior to stripping of site topsoil.
- A sediment control fence and cut off drain will be installed to the east of the Heritage Core to prevent impacts during construction. The fence will be checked and reinstated (if needed) on a weekly basis.
- Stockpile/s are to be located away from drainage lines and surface flow paths. Contoured striations or furrows would be provided to stockpiles to minimise erosion.
- A stabilised construction entrance is to be established prior to access to site by construction vehicles. Aggregate is to be turned when sediment builds up and renewed when required.
- Ensure soil is appropriately compacted and stabilised prior to and post construction, particularly along the quarry cliffs.
- Revise and review the EMPP and associated protocols as required throughout construction.
- Protocols for soil compaction would be incorporated into the CEMP to ensure safe procedures.
- Where underground stormwater drainage is installed to internal roadworks, provide inlet filters.
- An Environment Protection Agreement is to be taken out by the contractor with the EPA.
- All new construction work would be contained within the site except for approved service connections and roadworks.
- Limit access to site during and immediately after wet weather.
- Regularly remove any soil on adjacent roads.
- No storage of construction materials, or parking of vehicles and equipment would be permitted outside of the site without TCCS approval.
- No site sheds, storage sheds or site amenities would be erected outside of the site without TCCS approval.
- Provide kerbside filter roll to existing sumps. Kerbside filter rolls to be removed, cleaned and reinstated on a weekly basis at a minimum. Trapped sediment about sumps to be removed. Cleaning also to take place immediately after periods of rainfall during construction.
- All service trenches to be backfilled within 24 hours of inspection.
- Excess soil to be disposed at an EPA approved location

- The site foreman is to contact the EPA to arrange a site inspection and endorsement of sediment and erosion control measures prior to works commencing.
- The site foreman is to contact the EPA to discuss any proposed major changes to sediment and erosion controls on site prior to implementing the changes.
- Discharge from the pond would be permissible when the water pH is 6.5-8.5 and is clarified to at or below 60 mg/L (50 NTU). If sediment level is greater, then prior to discharge, the water must be dosed with either alum or gypsum and allowed to settle until the sediment level is less that 60 mg/L (50 NTU).
- Water levels in the sediment control ponds is to be maintained at less than 20% of capacity to allow for adequate runoff storage during rain events.
- Regular dredging of sediment control ponds would be carried out to remove silt.
- Site drawings and detail would be provided to the EPA for approval prior to works commencing.
- The area around site C would be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. Areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).

It is noted that additional geotechnical investigations would also be carried out prior to construction, in order to determine the most appropriate construction methods for the Proposal Area.

The application of these management measures against the risks identified in **Section 15.1** and their associated residual risks are outlined below in **Section 15.6**.

15.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
G1	Ensure detailed geotechnical investigations of the Proposal Area are undertaken to inform design (completed). Soil compaction would be used to ensure soil stability for the Proposed development, particularly along the quarry cliffs. Site drawings and detail must be provided to Environment Protection Authority, for approval prior to works commencing.	2-unlikely	4-major	M	Yes
Construction					
G2	Develop and implement industry best practice CEMP prior to construction, that includes an ESCP.	3-possible	2-minor	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
	Implement dust suppression measures such as dampening exposed soil and ceasing work during windy conditions throughout construction. Ensure soil is appropriately compacted and stabilised prior to and post construction. A sediment control fence and cut off drain to be installed to the east of the Heritage Core to prevent impacts during construction. The fence is to be checked and reinstated (if needed) on a weekly basis. Stockpile/s to be located away from drainage lines and surface flow paths. Contoured striations or furrows to be provided to stockpiles to minimise erosion. Where underground stormwater drainage is installed to internal roadworks, provide inlet filter. Environment Protection Agreement to be taken out by contractor with EPA. All new construction work to be contained within the site except for approved service connections and roadworks. Limit access to site during and immediately after wet weather. Regularly remove any soil from roads adjacent to the site. No storage of construction materials, or parking of vehicles and equipment permitted outside of block without TCCS approval. No site sheds, storage sheds or site amenities to be erected outside of block without TCCS approval. Provide kerbside filter roll to existing sumps. Kerbside filter rolls to be removed, cleaned and reinstated on a weekly basis at a minimum. Trapped sediment about sumps also to be removed. Cleaning also to take place immediately after periods of rainfall during construction. All service trenches to be backfilled within 24 hours of inspection. Excess soil is to be disposed at an EPA approved location.				

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
	The site foreman is to contact the EPA to arrange a site inspection and endorsement of sediment and erosion control measures prior to works commencing. The site foreman is to contact the EPA to discuss any proposed major changes to sediment and erosion controls on site prior to implementing the changes. Discharge from the pond is permissible when the water pH is 6.5–8.5 and is clarified to at or below 60 mg/L (50 NTU). If sediment level is greater, then prior to discharge, the dam must be dosed with either alum or gypsum and allowed to settle until the sediment is less that 60 mg/L (50 NTU). Water level in sediment control ponds to be maintained at less than 20% of capacity to allow runoff storage during a rain event. Regular dredging of the dam must be carried out to remove silt. The area around site C will be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. Areas demonstrating anticlinal folding will also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).				
G3	Undertake additional detailed geotechnical investigations to confirm most appropriate construction methods. Stabilised construction entrance to be constructed prior to access to site by construction vehicles. Aggregate to be turned when sediment builds up and renewed when required. Carry out appropriate stabilisation and compaction work prior to and post construction. Ensure protocols for soil compaction are included in the CEMP to ensure safe work.	2-unlikely	3-moderate	W	Yes
Operation					
G4	Ensure soil is appropriately compacted and stabilised prior to and post construction.	1-remote	4-major	W	Yes

16.0 Ecology and Natural Environment

Section Summary
This Section provides an assessment of the potential impacts to ecology and the natural environment associated with the Proposal. In particular, this section considers impacts to the EPBC Act listed, vulnerable species, golden sun moth.

16.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
B1	Presence or extent of threatened species or ecological communities or other protected matters (e.g. native vegetation) is not identified prior to development design, resulting in unanticipated impacts.	2-unlikely	4-major	M	No
B2	Development requires the removal of more trees than was approved, resulting in non-compliance with PD Act or EPBC Act approvals, potential loss of visual amenity and delays in receiving additional approval.	3-possible	3-moderate	M	No
B3	Inappropriate landscape plants are chosen, with regard to ecological and social impacts to surrounding areas.	3-possible	3-moderate	M	No
B4	Intrusive site investigations (e.g. geotechnical, contamination test pitting) are undertaken prior to PD Act and EPBC Act Approval resulting in impacts to MNES and potential non-compliance with either Act.	3-possible	3-moderate	M	No
B5	Issues with proposed offset site availability and suitability (e.g. lease arrangements, land zoning etc.) result in delays to the approvals process impacting on the proposal timeframe.	3-possible	3-moderate	M	No
Construction					
B6	Non-compliance with PD Act and EPBC Act approval.	3-possible	3-moderate	M	No
B7	Removal of mature, hollow-bearing trees impacts upon the habitat and dispersal of arboreal species.	2-unlikely	3-moderate	W	No

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
B8	Spread of invasive species off-site, e.g. Chilean needlegrass, African lovegrass.	4-likely	3-moderate	H	No
B9	Construction activities result in environmental impacts that are not reported or otherwise acted upon adequately.	3-possible	3-moderate	M	No
Operation					
B10	Re-establishment of weed infestation, leading to increased risk to off-site areas.	3-possible	3-moderate	M	No

16.2 Existing Conditions and Values

16.2.1 Flora, Fauna and Landscape Diversity

The Proposal Area comprises a mosaic of exotic dominated vegetation types characterised by wooded areas of introduced tree species and patches of exotic grassland (Umwelt, 2014). Trees and shrubs throughout the Proposal Area provide shelter, foraging and breeding habitat for a limited range of fauna species. Due to the dominance of exotic flora species, the quality of habitat for breeding and foraging is generally poor except for native fauna species tolerant of highly modified vegetation types.

Due to the highly disturbed nature of the Proposal Area, it does not include areas of important flora or fauna diversity.

16.2.2 Uncommon, Rare or Endangered Flora, Fauna, Communities, Natural Landscapes or Phenomena

The historical use of the Proposal Area as brickworks, including an associated quarry and railway, has disturbed most of the natural values of the site. Umwelt (2015) (refer to Appendix F26 in **Appendix F**) identified that all vegetation types present within the Proposal Area were highly modified and dominated by exotic species.

Golden sun moth, a species listed as vulnerable under the EPBC Act and endangered under the NC Act is known to occur in the south-eastern section of the Proposal Area in open and lightly timbered areas immediately north and south of Denman Street and in small open patches adjacent to wooded areas near the southern boundary of the Proposal Area. It is noted that at the time of preparing the draft EIS, the species was listed as critically endangered under the EPBC Act. In December 2021, the species was relisted as vulnerable. This is further discussed in **Section 16.4.1** below.

No other uncommon, rare or endangered flora or fauna species or ecological communities have been identified within the Proposal Area.

16.3 Investigations

The following ecological investigations have been conducted at the CBP:

- Umwelt (2014) Canberra Brickworks and Environs Ecological Assessment. Unpublished report to the Land Development Agency, December 2014 (refer to Appendix F25 in **Appendix F**).
- Umwelt (2015) Ecological Assessment at Revised Brickworks Project Area. Unpublished letter to the Land Development Agency, November 2015 (refer to Appendix F26 in **Appendix F**).
- Umwelt (2016) Golden Sun Moth Survey and Ecological Assessment of the Dudley Street Road Reserve. Letter prepared for the Land Development Agency. 10 February 2016 (refer to Appendix F27 in **Appendix F**).
- Biosis (2017a) Ecological Assessment Gap Analysis for the Canberra Brickworks (Blocks 1, 7 and 20, Section 102, Yarralumla). Letter prepared for Doma Group (refer to Appendix F28 in **Appendix F**).
- Biosis (2017b) Targeted Survey for the Golden Sun Moth at Yarralumla Brickworks (Blocks 1,7 and 20, Section 102, Yarralumla). Letter prepared for Doma Group (refer to Appendix F29 in **Appendix F**).
- Umwelt (2018), Offset Strategy: Dudley Street Upgrade and Canberra Brickworks Precinct Access Road Construction. Prepared for Chief Minister, Treasury and Economic Development Directorate (refer to Appendix F30 in **Appendix F**).
- Umwelt (2020a) EPBC Act Offset Assessment Guide Calculations (refer to Appendix F31 in **Appendix F**).
- Umwelt (2020b) Golden sun moth surveys, Canberra Brickworks. Letter prepared for Doma Group (refer to Appendix F32 in **Appendix F**).
- Umwelt (2021b) Canberra Brickworks – Environmental Offsets Supplementary Report. Briefing note prepared for Doma Group (refer to Appendix F50 in **Appendix F**).

An EPBC Act Protected Matters Search was also undertaken on 29 May 2020 for the Proposal Area, with a 10 km buffer (ref. PMST_7M7S6I). This tool was used to identify the likelihood of threatened ecological communities, threatened species, or migratory species that may potentially occur in the Proposal Area. Two listed threatened ecological communities, 42 listed threatened species and 14 listed migratory species that occur, or have the potential to occur, in the search area were identified.

In addition, the ACT Government public mapping tool (ACTMapi) was overlaid on the Proposal Area to identify any records of threatened ecological communities or species, and registered trees.

16.3.1 Likelihood of Occurrence Assessment

Utilising the studies listed above, in combination with available data, a likelihood of occurrence assessment was undertaken for potential threatened species and ecological communities occurring within the Proposal Area.

The ACTMapi layer 'Significant Species, Vegetation Communities and Registered Trees' showed that there were no records of threatened species or ecological communities within the Proposal Area. One record of spotted-tailed quoll (*Dasyurus maculatus*), a threatened fauna species, has been identified approximately one kilometre to the south-west of the Proposal Area. This single record of the species is from 1968 and would suggest there is a low potential for this species to rely upon the area for life cycle requirements, particularly as it has not been recorded since.

No registered or provisionally registered trees were identified within the Proposal Area. The nearest registered trees are Atlas cedar (*Cedrus atlantica*) on Banks Street approximately 200 m east of the Proposal Area.

Hollow-bearing trees have not been identified within the Proposal Area. However, it is noted that the majority of existing eucalyptus trees (approximately 35) will be retained as part of the Proposal (refer to Appendix F11 in **Appendix F**). As noted within the likelihood of occurrence table (see **Table 16.2**), the present likelihood of arboreal species occurring within the Proposal Area is considered to be low due to the absence of available habitat. These species are likely to only transit through the CBP.

Confirmation as to the presence of hollow-bearing trees would be achieved through the preparation of a Flora and Fauna Management Plan as part of the CEMP, prior to construction commencing. The Proposal also includes substantial replanting, as demonstrated in the draft Landscape Master Plan (refer to Appendix F46 in **Appendix F**). Once operational, the Proposal will provide healthy trees for arboreal species to use when dispersing to surrounding areas.

Further examination of record data identified four threatened bird species listed under the NC Act that have been recorded within 1 km of the Proposal Area. None of these species are listed on the EPBC Act.

The following **Table 16.1** provides definitions for terms used in the subsequent **Table 16.2** describing the likelihood of occurrence for listed species on, or in the vicinity of, the Proposal Area.

Table 16.1 Likelihood of Occurrence Criteria

Likelihood	Criteria
Recorded	The species has been recorded in the Proposal Area.
High	It is highly likely that a species inhabits the Proposal Area and is dependent on identified suitable habitat (i.e., for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the Proposal Area. Also includes species known or likely to visit the Proposal Area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the Proposal Area. Species unlikely to maintain sedentary populations, however, may seasonally use resources within the Proposal Area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitat within the Proposal Area, or habitat is in a modified or degraded state.
Low	It is unlikely that the species inhabits the Proposal Area given the lack of suitable habitat in the Proposal Area. It may be a rare, or very rare visitor during dispersal through the area but is unlikely to utilise vegetation in the Proposal Area.

A likelihood of occurrence assessment for matters listed under the EPBC Act and/or the NC Act is presented in **Table 16.2**.

Table 16.2 Likelihood of Occurrence

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
Ecological Communities				
Natural Temperate Grassland of the South Eastern Highlands		CE	CE	**Low**. No native vegetation types persist in the Proposal Area.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	CE	**Low**. No native vegetation types persist in the Proposal Area.
Fauna				
Actitis hypoleucos	common sandpiper	Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.
Anthochaera phrygia	regent honeyeater	CE	CE	**Low**. There is no suitable habitat present in or near the Proposal Area.
Aprasia parapulchella	pink-tailed worm-lizard	V	V	**Low**. There is no suitable habitat present in or near the Proposal Area.
Apus pacificus	Pacific swift	Mi		**Low**. There is no suitable habitat present in the Proposal Area. This species is likely to occasionally occur above the Proposal Area.
Botaurus poiciloptilus	Australasian bittern	E	E	**Low**. There is no suitable habitat present in or near the Proposal Area.
Calidris acuminata	sharp-tailed sandpiper	Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.
Calidris ferruginea	curlew sandpiper	CE, Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.
Calidris melanotos	pectoral sandpiper	Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.
Chalinolobus dwyeri	large-eared pied bat	V		**Low**. There is no suitable habitat present in the Proposal Area.
Daphoenositta chrysoptera	varied sittella		V	**Low**. There is no suitable habitat present in the Proposal Area.
Dasyurus maculatus	spotted-tailed quoll	E	V	**Low**. There is no suitable habitat present in or near the Proposal Area.
Delma impar	striped legless lizard	V	V	**Low**. There is no suitable habitat present in the Proposal Area.
Gallinago hardwickii	Latham's snipe	Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.
Grantiella picta	painted honeyeater	V	V	**Low**. There is no suitable habitat present in or near the Proposal Area.

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
Hieraaetus morphnoides	little eagle		V	**Low**. There is no suitable habitat present in the Proposal Area. This species is likely to occasionally occur above the Proposal Area given it has been recorded within 1 km of the Proposal Area in the North Curtin Horse Paddocks.
Hirundapus caudacutus	white-throated needletail	V, Mi	V	**Low**. There is no suitable habitat present in the Proposal Area. This species is likely to occasionally occur above the Proposal Area given it has been recorded within 1 km of the Proposal Area in the North Curtin Horse Paddocks.
Lalage tricolor	white-winged triller		V	**Low**. There is no suitable habitat present in the Proposal Area. White-winged triller are likely to occasionally disperse through the Proposal Area given they are regularly recorded within 1 km of the Proposal Area in the North Curtin Horse Paddocks.
Lathamus discolor	swift parrot	CE	CE	**Low**. There is no suitable habitat present in the Proposal Area. Swift parrot may very occasionally disperse through the Proposal Area given they have been recorded nearby in Curtin.
Limosa lapponica	bar-tailed godwit	V		**Low**. There is no suitable habitat present in or near the Proposal Area.
Litoria aurea	green and golden bell frog	V	V	**Low**. There is no suitable habitat present in or near the Proposal Area.
Litoria booroolongensis	Booroolong frog	E		**Low**. There is no suitable habitat present in or near the Proposal Area.
Litoria castanea	yellow-spotted tree frog	CE	CE	**Low**. There is no suitable habitat present in or near the Proposal Area.
Maccullochella peelii	Murray cod	V		**Low**. There is no suitable habitat present in or near the Proposal Area.
Macquaria australasica	Macquarie perch	E	E	**Low**. There is no suitable habitat present in or near the Proposal Area.
Monarcha melanopsis	black-faced monarch	Mi		**Low**. There is no suitable habitat present in the Proposal Area.
Motacilla flava	yellow wagtail	Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
Myiagra cyanoleuca	satin flycatcher	Mi		**Low**. There is no suitable habitat present in the Proposal Area. This species is likely to occasionally move through the Proposal Area during migratory movements. It has been recorded within 1 km of the Proposal Area in the North Curtin Horse Paddocks.
Numenius madagascariensis	far eastern curlew	CE, Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.
Pandion haliaetus	osprey	Mi		**Low**. There is no suitable habitat present in or near the Proposal Area.
Petauroides volans	greater glider	V	V	**Low**. There is no suitable habitat present in or near the Proposal Area.
Petroica boodang	scarlet robin		V	**Low**. There is no suitable habitat present in the Proposal Area. Scarlet robin may occasionally disperse through the Proposal Area given it has been recorded within 1 km of the Proposal Area in the North Curtin Horse Paddocks.
Petrogale penicillata	brush-tailed rock-wallaby	V	E	**Low**. There is no suitable habitat present in or near the Proposal Area.
Phascolarctos cinereus	koala	V	V	**Low**. There is no suitable habitat present in or near the Proposal Area.
Polytelis swainsonii	superb parrot	V	V	**Low**. There is no suitable habitat present in the Proposal Area. Superb parrot may occasionally disperse through or above the Proposal Area given it has been recorded within 1 km of the Proposal Area in the North Curtin Horse Paddocks.
Pteropus poliocephalus	grey-headed flying-fox	V	V	**Low**. There is no suitable habitat present in the Proposal Area.
Rhipidura rufifrons	rufous fantail	Mi		**Low**. There is no suitable habitat present in the Proposal Area. This species is likely to occasionally move through the Proposal Area during migratory movements. It has been recorded within 1 km of the Proposal Area in the North Curtin Horse Paddocks.
Rostratula australis	Australian painted snipe	E	E	**Low**. There is no suitable habitat present in or near the Proposal Area.
Synemon plana	golden sun moth	CE	E	**Recorded**. There is suitable low-quality habitat present in the Proposal Area.
Tympanocryptis pinguicolla	grassland earless dragon	E	E	**Low**. There is no suitable habitat present in or near the Proposal Area.

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
Flora				
Ammobium craspedioides	Yass daisy	V		**Low**. There is no suitable habitat present in the Proposal Area.
Amphibromus fluitans	river swamp wallaby-grass	V		**Low**. There is no suitable habitat present in the Proposal Area.
Cupaniopsis tomentella	Boonah tuckeroo	V		**Low**. There is no suitable habitat present in the Proposal Area.
Dodonaea procumbens	Trailing hop-bush	V		**Low**. There is no suitable habitat present in the Proposal Area.
Eucalyptus aggregata	black gum	V	V	**Low**. There is no suitable habitat present in the Proposal Area.
Lepidium ginninderrense	Ginninderra peppercress	V	E	**Low**. There is no suitable habitat present in the Proposal Area.
Lepidium hyssopifolium	basalt pepper-cress	E		**Low**. There is no suitable habitat present in the Proposal Area.
Leucochrysum albicans var. *tricolor*	hoary sunray	E		**Low**. There is no suitable habitat present in the Proposal Area.
Pomaderris pallida	pale pomaderris	V	V	**Low**. There is no suitable habitat present in the Proposal Area.
Prasophyllum petilum	Tarengo leek orchid	E		**Low**. There is no suitable habitat present in the Proposal Area.
Rutidosis leptorrhynchoides	button wrinklewort	E	E	**Low**. There is no suitable habitat present in the Proposal Area.
Swainsona recta	small purple-pea	E	E	**Low**. There is no suitable habitat present in the Proposal Area.
Thesium australe	Austral toadflax	V	V	**Low**. There is no suitable habitat present in the Proposal Area.

**V= Vulnerable, E=Endangered, CE = Critically Endangered, Mi = Migratory.*

Other than the recorded presence of golden sun moth, it is considered that there is a low likelihood of occurrence for any other threatened species or ecological community listed under either the EPBC Act or the NC Act to occur within the Proposal Area. As such, only impacts to the golden sun moth are considered in further detail in **Section 16.4** below.

There are no other relevant MNES listed under the EPBC Act within the Proposal Area.

16.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for biodiversity in **Section 16.1** above, the potential impacts of the proposed redevelopment of the CBP relating to biodiversity may be characterised as:

- Impacts on golden sun moth, and
- Spread of invasive/weed species off-site.

These potential impacts are further discussed below.

16.4.1 Golden sun moth (*Synemon plana*)

Golden sun moth is a vulnerable species which occurs in a range of grassland types in south-eastern Australia from western Victoria to central NSW. The ACT is known to support approximately 1,800 ha of golden sun moth habitat across approximately 78 sites (EPSDD, 2020). Golden sun moths occur in native grassland and grassy woodlands containing wallaby grass (*Rhytidosperma spp*.) and speargrass (*Austrostipa spp*.), as well as in degraded grasslands dominated by Chilean needle grass (DEWHA, 2009).

The chief threat to golden sun moth is the loss, degradation and fragmentation of habitat primarily through the clearance of grassy ecosystems for agriculture and urban development. Golden sun moth is sensitive to certain development impacts due to its limited dispersal ability, seasonal lifecycle (underground larvae), short adult lifespan, specific habitat requirements and fragmented distribution. The limited dispersal ability of golden sun moths means habitat areas separated by more than 200 m are effectively isolated and should be considered as separate habitat areas (DEWHA, 2009).

Golden sun moths are present in grassland and lightly timbered areas of land to the south-west, south and south-east of the Proposal Area at the following locations:

- The northern, central, and south-central sections of North Curtin Horse Paddocks.
- Between Yarralumla Creek and See Place.
- The roadside verge of Cotter Road between approximately Lady Denham Drive and Dunrossil Drive.
- In the majority of open and lightly timbered areas between Cotter Road and Denman Street from Dunrossil Drive to the Yarralumla Uniting Church.
- Between Kintore Crescent and Dudley Street east to Kent Street.
- Between Adelaide Avenue and Guilfoyle Street from Rodway Street to Cambage Street.

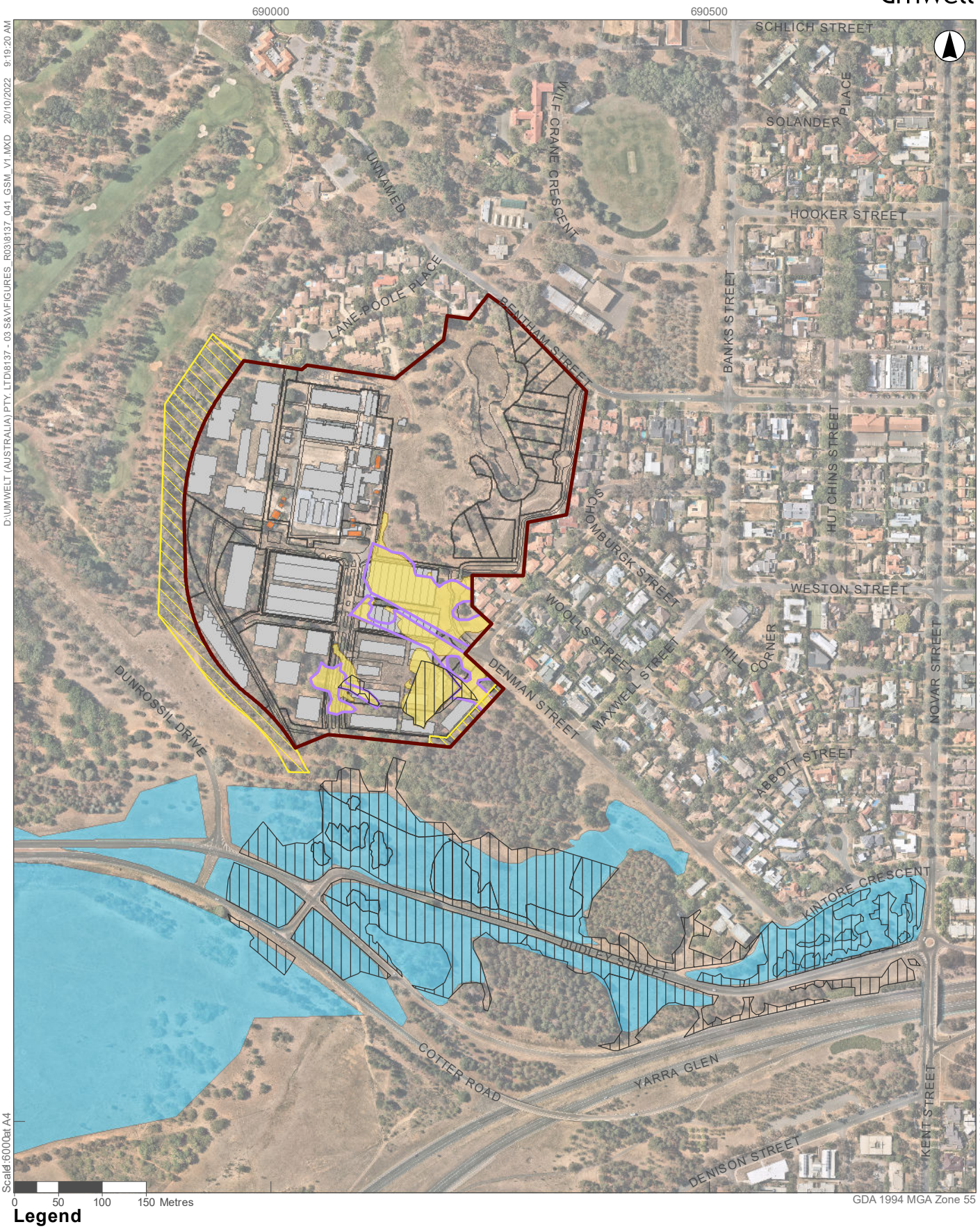
In the greater area, golden sun moths are present at Yarralumla Park, in west Deakin, at various locations between Lake Burley Griffin and Yarralumla, and in small, isolated patches within Yarralumla.

Golden sun moths occur in the south-eastern section of the Proposal Area in open and lightly timbered areas immediately north and south of Denman Street and in small open patches adjacent to wooded areas near the southern boundary of the Proposal Area. The findings of ecological surveys in the Proposal Area indicate that the extent of golden sun moth habitat and their area of occupancy at this location has increased during the past decade (Umwelt, 2020b) (refer to Appendix F32 in **Appendix F**).

As of 2019 there is a total of 1.58 ha of suitable golden sun moth habitat present in the Proposal Area (Umwelt, 2020b) (Appendix F32 in **Appendix F**) refer to **Figure 16.1** and **Table 16.3**. The development of the CBP will therefore directly impact on 1.58 ha of golden sun moth habitat, within areas of exotic grassland dominated by Chilean needlegrass. This impact is known, irreversible and predictable, noting that the proposed development will require clearing of the entire Proposal Area.

Table 16.3 Comparison of Golden Sun Moth Habitat Area Reported by Umwelt (2020b)

Zone	Description	Biosis (2017) (ha)	Umwelt (2018) (ha)	Umwelt (2019) (ha)
1	Exotic grassland – Chilean needle grass-dominated	0.70	-	0.69
2	Exotic grassland – Chilean needle grass-dominated	0.37	-	0.32
3	Exotic grassland – Chilean needle grass-dominated	0.17	-	0.24
4	Exotic grassland – mixed golden sun moth feed species (additional areas not mapped by Biosis)	-	0.30	0.33
	Total	**1.24**	**0.30**	**1.58**



Legend

- Proposal Area
- Asset Protection Zone
- Structures to be Demolished
- Golden Sun Moth Habitat (ACTMapi 2021)
- Golden Sun Moth Habitat (Biosis 2017)
- Golden Sun Moth Habitat (Umwelt 2018)
- Golden Sun Moth Habitat (Umwelt 2020)

FIGURE 16.1

Golden Sun Moth within the Proposal Area and Surroundings

Image Source: Nearmap (Jan 2020) **Data source:** www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2020); Biosis (2017); Umwelt (2108,2020)

16.4.1.1 Connectivity with Nearby Habitat

As aforementioned, the EPBC Act listing status for golden sun moth was recently revised from critically endangered to vulnerable, in December 2021. However, as the conservation advice for the species has not been revised to date, the impact assessment for the Proposal on the species has remained largely unchanged.

The Significant Impact Guidelines for golden sun moth (DEWHA, 2009) note that the limited dispersal ability of the golden sun moth means habitat areas separated by greater than 200 m are effectively isolated and should be considered as separate habitat areas. Adult female golden sun moths have poor dispersal capabilities and as such extinction of isolated populations has a significant bearing on the species' overall population viability given that in many cases re-invasion of previously occupied land is highly unlikely.

The degree of connectivity, with regard to movement of males and females and the level of population flow, between habitat in the Proposal Area and habitat to the south-east located between Dudley Street and Denman Street is currently unknown. The distance between habitat patches confirmed to be occupied in the Proposal Area and habitat to the south-east has decreased with each targeted survey conducted in the Proposal Area in recent years from at least 200 m in 2015 (Umwelt, 2015) to approximately 100 m in 2016 (Biosis 2017) and 2019 (Umwelt, 2020b). Biosis (2017) hypothesised that the identification of golden sun moths in a small patch to the south of Denman Street suggested that the population in the Proposal Area is likely connected with the population described by Umwelt (2014) between Denman and Dudley Streets to the south-east. However, at this location, the patches of occupied habitat are separated by a dense stand of mature Monterey pine approximately 100 m in width at its narrowest point. This is likely to act as a barrier to the effective dispersal of golden sun moth, and as such it is considered more likely that these are two small, fragmented patches of habitat.

A second location of potential movement between occupied habitat is the southern verge of Denman Street, between its intersections with Woolls Street and Maxwell Street. Distribution of the large continuous patch of golden sun moth habitat between Dudley Street and Denman Street reaches its northern limit opposite 31 Denman Street according to ACTMAPi. However, observations made during site inspections of male golden sun moths on the Denman Street verge opposite 24 Denman Street in November 2019 suggests that connectivity is very likely, at least in terms of movement of males, between habitat in the extreme south-east of the Proposal Area and the Denman Street verge to the south-east. Given the distance (60 m) and the lack of any considerable barrier between such locations, such as a road or dense stand of trees, connectivity between the two habitat areas cannot be discounted. To date there have been no female golden sun moths recorded in the Proposal Area; however, due to the amount of survey effort and the relatively cryptic nature of female moths, this may not reflect a true absence (Biosis, 2017b; Umwelt, 2020b) (Appendix F29 and F32 in **Appendix F**).

16.4.1.2 Impact Assessment

Golden sun moth will be affected by a range of direct and indirect impacts associated with the Proposal. The nature of the impacts to golden sun moth may be summarised as follows:

- **Fragmentation**: As described above in **Section 16.4.1.1,** the connectivity of habitat within the area is uncertain. The broader semi-connected patch within the area has a number of barriers, such as trees and major roads. The Proposal is unlikely to fragment an existing population into two or more populations or reduce the connectivity of a population, having regard for the Proposal Area's existing lack of connectivity to nearby habitat within the broader area. In particular, the habitat existing within the Proposal Area does not appear to have any connectivity to populations located to the north of the Proposal area, due to the urban context of the site and its surrounds. The Proposal Area is at the extent of a larger area of habitat surrounding Dudley Street and Cotter Road, and its removal would not result in any fragmentation of remaining habitat.

- **Changes in hydrology**: Increased impermeable surfaces may alter local hydrological conditions, although, as noted in **Section 10.0** of this EIS, all surface water would flow into the proposed sedimentation basin, wetland and pond, to be located to the north-east of the Proposal Area. As such, flow is likely to be directed away from remnant golden sun moth habitat to the south of the Proposal Area.

- **Weed invasion and changes to species composition***:* This may result from changes to hydrology or from the introduction of weed species during the construction and operational phases of the Proposal. This is further discussed in **Section 16.4.1.2**.

- **Mortality**: some individuals would likely be killed during construction of the Proposal.

There is approximately 8.55 ha of golden sun moth habitat within and immediately surrounding the Proposal Area. This is within the context of a broader patch of semi-connected golden sun moth habitat that occurs within the Proposal Area, Cotter Road verges, North Curtin Horse Paddocks, Lady Denman Drive verges, and Yarra Glen verges (Umwelt, 2018). Through the construction of the approved Dudley Street upgrade and Brickworks Way access road, this patch is expected to be reduced to 5.38 ha.

The Proposal would result in the removal of all 1.58 ha of golden sun moth habitat present in the Proposal Area. This accounts for approximately 30% of the remaining semi-connected patch following construction of the Dudley Street upgrade and Brickworks Way access road.

As noted within the EPBC Referral 2017/8074, the Proposal is likely to result in a significant impact to golden sun moth, exceeding the impact threshold stated in the Significant Impact Guidelines for golden sun moth (**Table 16.4**) (DEWHA, 2009).

Table 16.4 Impact Thresholds of Affected Golden Sun Moth Habitat Areas

Ecological element affected	Impact Threshold
Large or contiguous habitat area (>10 ha)	Habitat loss, degradation, or fragmentation >0.5 ha
Small or fragmented habitat area (<10 ha)	Any habitat loss, degradation, or fragmentation
Habitat connectivity	Fragmentation of a population through the introduction of a barrier to dispersal

The Proposal would render habitat located in the north-western corner of what is likely a single, semi-connected population, which consists of habitat in the Proposal Area and habitat to the south and south-east of the Proposal Area, unsuitable for golden sun moth. The action would also contribute to a cumulative impact of incremental loss of habitat for golden sun moth in the central Canberra area and a resulting contraction in the species distribution.

However, it is noted that the entirety of habitat to be removed within the Proposal Area consists of exotic pasture dominated by Chilean needle grass. Chilean needle grass is a weed of national significance (WONS) and a declared Class 3 pest plant in the ACT pursuant to the Pest Plants and Animals Declaration 2005 (No 1). Consequently, this pasture provides little ecological value to other species, whether threatened or otherwise, within the Proposal Area or its broader context.

As a result of the topography, presence of planted trees, and highly disturbed nature of the remaining areas of golden sun moth habitat to the south of the Proposal Area (noting the existing presence of significant weed infestations), and in light of the approved impacts associated with the Dudley Street upgrade and Brickworks Way access road; indirect impacts to habitat as a result of the Proposal are not expected to exceed existing levels. Any unpredicted or unknown indirect impacts would be managed through a Flora and Fauna Management Plan, to be incorporated into the CEMP.

16.4.2 Spread of Weeds Off-site

Construction works can result in the spread of weeds, dependent on the type of weeds present on site, and the activities being undertaken. Weeds are one of the most significant threats to biodiversity in the ACT, and also impose significant economic impacts with regard to the cost of management programs, loss of agricultural productivity and impaired landscape function.

The Proposal Area and its surrounds, particularly along Denman Street, currently have a significant infestation of Chilean needle grass and African lovegrass (*Eragrostis curvula*) (see **Photo 16.1**). While African lovegrass is not considered to be a WONS, it is a declared pest plant species in the ACT listed under the Pest Plants and Animals Declaration 2005 (No 1). All land managers within the ACT have a responsibility to manage weed issues on their land as an environmental duty of care, and as such, appropriate weed management is required.

Photo 16.1 Significant Weed Infestations at the Existing Entrance to the CBP (Umwelt, 2020)

Weed management measures require detailed planning and implementation at appropriate times to maximise their effectiveness and minimise impacts to native vegetation. Weed control would be required prior to vegetation removal and topsoil stripping. Furthermore, this topsoil would need to be appropriately managed and disposed of during construction to avoid dispersal of exotic and pest species. The relevant timeframes and appropriate measures would be specified within a weed management plan, which would be a sub-management plan to the CEMP.

16.5 Proposed Mitigation Measures and Offsets

A CEMP would be prepared for the Proposal prior to commencement of work, and OEMP would be prepared prior to occupation. The CEMP would include standard construction measures and a Flora and Fauna Management Plan to ensure that disturbance of native flora and fauna is minimised to the greatest extent possible during the construction phase of the Proposal. Similarly, the OEMP would include landscaping management measures to ensure the Proposal provides appropriate landscaping and ongoing maintenance to encourage native flora and fauna within the area. Such measures would include:

- Clear identification of trees that have received approval for removal within final designs. Where additional trees are identified as requiring removal during construction, assessment and approval would be sought where appropriate.
- Ensuring landscape species are suitable for urban use and are compatible with surrounding species within Yarralumla.
- Establishment of no-go zones, site boundaries, and fences prior to construction to prevent unauthorised access into adjacent areas.

- Informing EPSDD immediately if there are any impacts outside the approved area.
- Conducting pre-clearing surveys to determine clearing boundaries and visibly identifying which trees are to be retained (if any).
- Confirming the presence of any mature, hollow-bearing trees. Where they are identified, a suitably qualified fauna-handler/ecologist is to remove any hollow-bearing fauna prior to clearing and mature, hollow-bearing trees.
- Conducting inspections for roosting bats and possums in building structures to be removed. A suitably qualified fauna-handler/ecologist is to remove any resident fauna within these structures.
- Requiring that contractors appoint a third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits are to be reported back to EPSDD and other agencies as appropriate.

As noted in **Section 9.0**, the proposed draft Landscape Master Plan (refer to Appendix F46 in **Appendix F**) includes the retention of some existing native species, and the replanting of deciduous trees throughout the Proposal Area. This is to replace the majority of trees across the Proposal Area, which are currently in poor condition.

16.5.1 Golden Sun Moth

As discussed in **Section 16.4.1** above, it was determined that the Proposal would have a significant impact on golden sun moth and was as such a controlled action. Avoidance and management measures for the existing golden sun moth habitat within the Proposal Area were considered, including designing the Proposal to avoid the habitat patch altogether. However, having regard for the nature and low quality of the habitat, consisting of an extensive Chilean needle grass infestation within an urban setting, these measures were not considered to achieve the best ecological outcome of the Proposal Area and surrounds as a whole. As a result of this, the Proposal would need to incorporate an offset strategy targeting this matter in order to compensate for impacts to golden sun moth under both the EPBC Act and PD Act.

The ACT Environmental Offsets Policy (Environment and Planning, 2015) states that for MNES, application of the Commonwealth environmental offsets policy is considered sufficient to offset residual environmental impacts within the ACT, and no further offsetting is required under the PD Act. As golden sun moth is a MNES, only the Commonwealth environmental offsets policy (DSEWPaC, 2012) is discussed in this section.

As discussed in the Environmental Offsets Supplementary Report (Umwelt, 2021b) (refer to Appendix F50 in **Appendix F**), there were no appropriate offsets within the ACT for golden sun moth when the Proposal was determining its offset requirements. This is due to a lack of available, unprotected habitat, in addition to the absence of any policy direction for private developers establishing offsets in the ACT. The majority of large, high quality golden sun moth habitat within the ACT is already protected. Potential offset sites identified in an Analysis of Potential Offset Sites Across the ACT (Umwelt, 2017) (prepared for EPSDD) had complexities associated with site custodianship (e.g. NCA land) or site usage (e.g. urban open space) that made them unsuitable as an offset for this Proposal.

As a result, the Proposal has sought to offset the impact to golden sun moth by purchasing credits under the Biodiversity Offsets Scheme (BOS) in New South Wales. Consultation with DAWE (then DoEE) was undertaken in March 2018, and the Proponent was advised that this approach would be considered acceptable in principle, due to their accreditation of the NSW BioBanking Scheme. Subsequent consultation with the ACT Offsets Team undertaken in April 2018, also confirmed that this approach would be acceptable in principle, however noted that the offset, if located in NSW should be as close to the ACT as possible.

The proposed offset, the 'Panorama BioBank Site' (Credit ID 549) is approximately 92.8 ha in size and is located on Old Cooma Road in Googong, NSW, approximately 4.5 km from the ACT border at Hume. It occurs in the Murrumbidgee Catchment Management Area (CMA) and is in the South Eastern Highlands Bioregion and Monaro subregion. It was subject to a Biodiversity Assessment Report (BAR) prepared by Umwelt in December 2017[10]. This BAR included extensive literature review, identification of landscape features, detailed biometric field surveys, and the calculation of ecosystem and species credits in accordance with BioBanking Assessment Methodology (BBAM) (OEH, 2014). Based on the assessment undertaken in Umwelt (2017), the proposed offset site contains 34.8 ha of golden sun moth habitat, which equated to 247 species credits.

As described in the Environmental Offsets Supplementary Report (Umwelt, 2021b), the key considerations when determining whether this site was appropriate for use as an offset for the Proposal were:

1) whether the offset was located in the same region as the impact

2) whether the long-term management of the site could be assured

3) whether the offset habitat was 'like-for-like' with the impacted habitat.

The offset identified is as close to the ACT as possible, within 5 km of the border. It is considered appropriate to utilise a cross border offset when the benefits to the biodiversity of the ACT Region are tangible, as with this example. The long-term management of the site is certain, through the established (and EPBC accredited) NSW BioBanking scheme, including the oversight, compliance monitoring, and funding of the offset through the BCT. The offset area also provides a better-quality example of golden sun moth habitat than the impact area. It does not represent habitat comprising Chilean needlegrass, as the impact area does, and has much higher long-term viability and resilience due to its larger patch size and quality.

As the BOS and the Commonwealth Offsets Policy were not designed to be interchangeable, the Commonwealth Offsets Assessment Guide was used as the basis for determining the number of credits required:

- Based on the total number of credits available and the total area of habitat within the BOS site, a credit per hectare value of 7.1 was determined.
- A very conservative estimate of the future quality of the BOS site has been assumed. This is because under the BOS, the Proponent cannot influence future habitat quality improvement. The Proponent has no ongoing input into the management of the land or monitoring/reporting under the Scheme. Rather,

[10] Umwelt (2017) *Panorama BioBank Site, Biodiversity Assessment Report, Final Following OEH Review*, prepared for Robin Pty Ltd (December 2017)

that is a requirement of the BOS property owner, who must then manage the site under a Biodiversity Stewardship Agreement, which places a covenant over the land.

- A low risk of loss percentage (5%) was also assumed, as the Scheme intends to ensure the preservation of the threatened species on the BOS site in perpetuity through the Biodiversity Stewardship Agreement.
- Using the updated Commonwealth Offsets Assessment Guide, following the relisting of golden sun moth as vulnerable, this information was used to determine the number of hectares required to achieve a complete (100%) direct offset. This was calculated to be 6.6 ha (refer to Appendix F31 in **Appendix F**).

This offset area was then multiplied by the credit per hectare value to provide an outcome of 46.86 credits (rounded up to **47 credits**) to ensure that impacts to golden sun moth as a result of the Proposal are entirely offset.

The Draft EIS (dated May 2021) concluded that 9.5 ha of offsets would be required to achieve a complete (100%) direct offset to compensate for residual impacts. Following the relisting of the golden sun moth from critically endangered to vulnerable on 7 December 2022, the offsets required have been recalculated for the Final EIS as 6.6 ha or 47 credits as stated above.

The Proponent has secured 35 credits from the Wandiyali Restoration Trust (Credit register ID Robin Pty Ltd, Credit ID 549), with an option agreement for an additional 65 credits in place. Subject to the determination of this EIS, it is proposed that the requisite number of credits would be purchased in order to adequately offset the proposed impact to golden sun moth. This is considered to be a positive ecological outcome, as it would result in the removal of a WONS and the conservation of good quality golden sun moth habitat within the region.

16.5.1.1 Applicable Recovery and Threat Abatement Plans

There is no national Recovery Plan for golden sun moth. There is one applicable Threat Abatement Plan for the species according to the Species Profile and Threats (SPRAT) database (DAWE, 2021): the Threat Abatement Plan for competition and land degradation by rabbits (DoEE, 2016) (Rabbit TAP). The Rabbit TAP identifies the European rabbit (*Oryctolagus cuniculus*) as a threat to endangered ecological communities and species. Rabbits present a threat to golden sun moth habitat through overgrazing and general damage to grass species, changes to soil structure and nutrient cycling, and preventing plant regeneration.

As the Proposal will remove all golden sun moth from the Proposal Area, the Rabbit TAP is not applicable to the species at the CBP. However, the Proponent commits to implementing an OEMP for the Proposal Area, which will include pest management. Rabbit populations would be strategically managed through the OEMP, noting their impacts to the environment more broadly.

Rabbits and other pest species would be managed at the offset site through the management and compliance requirements of the BOS (refer to Appendix F50 in **Appendix F**).

The ACT Golden Sun Moth Action Plan (EPSDD, 2017) (the Action Plan) was prepared to support and complement the Nature Conservation (Native Grassland) Action Plans 2017 (EPSDD, 2017). The specific objectives of the Action Plan are to:

- Conserve habitat, particularly through mowing or grazing and removal of weeds and potentially through patch burning.
- Provide offset areas, with management plans, for areas subject to urban development.
- Support ongoing research and monitoring.
- Enhance the long-term viability of populations through management of adjacent grassland to increase habitat area and connect populations.
- Collaborate with research institutions and non-government organisation and encourage citizen science and volunteers.

The golden sun moth habitat identified within the Proposal Area consists of Chilean needlegrass. As noted within the Action Plan, this represents both a risk and opportunity to the species. That is, while it has the potential to enhance populations and improve connectivity, there is a risk that it may make the species less resilient, particularly to drying climates. The maintenance of Chilean needlegrass for the purpose of golden sun moth habitat is not considered to be an appropriate ecological outcome, noting its severe impacts to native grasslands.

The Proposal would remove all Chilean needlegrass from the Proposal Area, thereby removing golden sun moth habitat. However, the Proposal would offset this impact, having identified an appropriate offset site within the South Eastern Highlands Bioregion and Monaro subregion. The Proposal is therefore considered to be consistent with the above objectives of the Action Plan.

16.5.2 Weed Management

The weed management plan, to be incorporated into the CEMP, would provide management measures for the prevention and control of weeds within the Proposal Area. In order to prevent the spread of weeds off-site, the following measures would be included in the weed management plan:

- Identify areas of weed infestation for removal, management and avoidance during and after construction.
- Ensure plant, equipment and clothing are free of soil and vegetative matter prior to being brought to site.
- Where possible, disturbance of native vegetation would be minimised.
- Monitor high-risk areas such as access roads, stockpiles, and bare ground.
- Ensure erosion controls are in place to minimise the spread of weeds from run off.
- Undertake weed removal activities where appropriate, including prior to and after construction.
- Do not use weed material as mulch on site unless it has been appropriately composted to remove any potential re-growth.

The weed management plan would be developed during the DA stage of the assessment process. Furthermore, an OEMP would be prepared for the Proposal prior to occupation, which would include an ongoing weed management plan for the Proposal Area. This would aim to contain, control and prevent any weeds occurring within the Proposal Area at the commencement of occupation.

The application of these management measures against the risks identified in **Section 16.1** and their associated residual risks are outlined below in **Section 16.6**.

16.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
B1	Base the impact assessment on site specific, recent environmental studies (completed). Use a precautionary approach and risk-based approach to impact assessment for the Proposal (completed).	1-remote	4-major	W	Yes
B2	Survey all trees on site prior to finalisation of design (completed). Seek approval under the PD Act and EPBC Act (as required) for the removal of any trees identified within the design process. Clearly identify trees that have received approval for removal within final designs. Where additional trees are identified as requiring removal during construction, seek approval under PD Act.	2-unlikely	3-moderate	W	Yes
B3	Ensure landscape species are suitable for urban use and are compatible with surrounding species within Yarralumla.	2-unlikely	3-moderate	W	Yes
B4	Liaise with EPSDD and DAWE prior to intrusive site investigations if they are to occur prior to an approval decision being made. Ensure EMP for site investigations identifies go / no-go zones and environmental controls.	2-unlikely	3-moderate	W	Yes
B5	Commence consultation with the ACT Government as soon as possible to identify potential offset options (completed). Engage with DAWE to confirm the appropriate offset approach (completed). Purchase credits under BOS to offset the proposed impact (completed).	2-unlikely	3-moderate	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Construction					
B6	Prepare a Flora and Fauna Management Plan as part of the CEMP prior to construction commencing. Conduct pre-clearing surveys to determine clearing boundaries and visibly identify which trees are to be retained (if any). Establish no-go zones, site boundaries, and fences prior to construction commencing. Inform EPSDD immediately if any impacts outside approved area occur.	2-unlikely	3-moderate	W	Yes
B7	Conduct pre-clearing surveys to determine clearing boundaries and visibly identify which trees are to be retained (if any). Confirm the presence of any mature, hollow-bearing trees. Where they are identified, a suitably qualified fauna-handler/ecologist is to remove any hollow-bearing fauna prior to clearing.	2-unlikely	2-minor	L	Yes
B8	Develop and implement industry best practice CEMP prior to construction, that includes a weed management plan that addresses potential spreading of existing invasive species (particularly Chilean needlegrass) through construction vehicles, personnel, and vegetation waste. Identify areas of weed infestation for removal, management and avoidance during and after construction. Ensure plant, equipment and clothing are free of soil and vegetative matter prior to being brought to site. Where possible, disturbance of native vegetation would be minimised. Monitor high-risk areas such as access roads, stockpiles, and bare ground. Ensure erosion controls are in place to minimise the spread of weeds from run off. Undertake weed removal activities where appropriate, including prior to and after construction. Do not use weed material as mulch on site unless it has been appropriately composted to remove any potential re-growth.	3-possible	3-moderate	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
B9	Require that contractors appoint a third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits are to be reported back to EPSDD and other agencies as appropriate.	2-unlikely	3-moderate	W	Yes
Operation					
B10	Develop and implement an industry best practice OEMP, including ongoing weed and pest management and monitoring measures.	3-possible	2-minor	W	Yes

The proposal will result in a significant impact to golden sun moth, a vulnerable species under the Commonwealth EPBC Act and endangered under the ACT Nature Conservation Act. An offset package designed to compensate for this impact has been proposed and would meet the objectives of the EPBC Act Offset Policy.

With respect to other aspects of the environment, risks associated with biodiversity would be reduced to as low as is reasonably practicable through the management, mitigation and offset measures proposed. It is acknowledged that a medium residual risk relating to weed infestations during construction remains even with the mitigation measures proposed. This can be attributed to the extensive weed infestation that exists within the Proposal Area, and therefore increased likelihood of occurrence, as a result of the site's disuse. Residual risks associated with the Proposal are further addressed in **Section 20.0** of this EIS.

17.0 Aboriginal, European and Natural Heritage

Section Summary
This Section assesses the potential impacts to the heritage significance of the CBP as a result of the Proposal by reviewing the heritage and archaeological studies undertaken to date. This Section also discusses the Proposal's aim to conserve, re-develop and integrate the heritage elements of the CBP into a distinctive cultural precinct.

17.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
H1	The Proposal results in impacts to the heritage values of the Yarralumla Brickworks and Railway Remnants due to the recommendations of the CMP (GML, 2021a) not being appropriately implemented during the design phase.	3-possible	4-major	H	No
H2	Material selection and finishes result in additional impacts to the heritage values of the Yarralumla Brickworks as they are not consistent with the CMP (GML, 2021a).	3-possible	4-major	H	No
Construction					
H3	Damage to sensitive environmental and heritage items caused by construction activities.	3-possible	4-major	H	No
H4	Earthworks result in the destruction of previously unidentified Aboriginal or European cultural heritage items.	2-unlikely	4-major	M	No
H5	Places listed on the ACT Heritage Register are damaged during construction beyond approved levels.	3-possible	3-moderate	M	No
H6	Construction and landscaping works impact upon/damage the Yarralumla Formation.	3-possible	3-moderate	M	No
Operation					
H7	Use of the Canberra Brickworks results in detrimental effects to the heritage values.	3-possible	4-major	H	No
H8	Places listed on the ACT Heritage Register are damaged during ongoing residential and recreational use.	2-unlikely	3-moderate	W	No

17.2 Existing Conditions and Values

17.2.1 Aboriginal Heritage

The CBP is located on traditional lands held by the Ngunnawal People. The Ngunnawal People have occupied the land for thousands of years and their descendants continue to live in Canberra and the surrounding region. Several Aboriginal peoples, including the Ngunnawal and Ngambri, were recorded to have settled along the banks of the Molonglo River (Navin Officer Heritage Consultants Pty Ltd, 2014, see Appendix F34 in **Appendix F**).

The Aboriginal archaeological potential of the CBP was considered as part of an Aboriginal Cultural Heritage Assessment (Stage 1) (Navin Officer Heritage Consultants Pty Ltd, 2014, see Appendix F34 in **Appendix F**). The assessment concluded that the brickworks and its environs contain no known Aboriginal places or objects and are of low Aboriginal archaeological potential. Further, any archaeological deposits would likely have been disturbed as a consequence of past land use practices. As an outcome of the Aboriginal Cultural Heritage Assessment, no statutory implications regarding cultural heritage apply to the Proposal Area. The Aboriginal Cultural Heritage Assessment was approved by the ACT Heritage Council on 11 September 2014.

No further assessment of Aboriginal heritage is provided in this EIS.

17.2.2 European Heritage

Prior to establishment of the Brickworks, the Proposal Area was in a gently undulating landscape surrounded by grazing land and juvenile plantations of radiata pine. While some sparse residential development occurred prior to the establishment of the Brickworks, the setting remained mostly unchanged until the interwar period. Most of Yarralumla's residential development took place in the latter half of the 20th century.

The Canberra Brickworks is an important industrial heritage site in the ACT, with identified historic, technological, aesthetic and social significance. The heritage significance of the Canberra Brickworks is recognised through the two heritage listings for the 'Yarralumla Brickworks' and the 'Yarralumla Brickworks Railway Remnants' on the ACT Heritage Register. The 'Yarralumla Brickworks' is also listed on the Australian Institute of Architects ACT Chapter Register of Significant Twentieth Century Architecture, item No. R063 and the 'Canberra Brickworks' was identified as a 'Classified' place by the National Trust of Australia (ACT) on 20 July 1981.

The Proposal Area comprises a range of built elements and industrial infrastructure constructed from various phases of the Brickworks' development and evolution. The site contains evidence from the four phases of development: establishment, expansion, post-war and post-closure, with each phase reflecting technical developments and building requirements. The built structures at the site include kilns, chimney stacks, fan houses, workshops, crusher houses, machine bays, primary supporting buildings, and ancillary structures as shown in **Figure 17.1.** Other historic features on the Proposal Area include the adjacent quarry, and remnants of the former railway.

The above Heritage Register listings include statements of significance, but do not include an assessment against criteria. Revised summary Statements of Significance for the Canberra Brickworks and the Railway Remnants are described in the CMP (GML, 2021a), which is attached as Appendix F38 in **Appendix F**. In 2021, GML Heritage Pty Ltd (GML) undertook historical archaeological test excavations across several areas of archaeological potential, which provided further information about the Proposal Area's archaeological features (Lovell Chen, 2022, see Appendix F36 in **Appendix F**). This is further discussed in **Section 17.3.**

Table 17.1 provides a summary of the values expressed in the CMP (GML, 2021a), including findings from the Archaeological Excavation Report (GML, 2022a, see Appendix F58 in **Appendix F**). Where the CMP or Archaeological Excavation Report go beyond the Register Entry, this has been indicated in italics.

Table 17.1 Summary of Heritage Significance (Lovell Chen, 2022)

Criterion	Summary of Significance
Criterion A (Historic): importance to the course or pattern of the ACT's cultural or natural history Criterion B (Rarity): has uncommon, rare or endangered aspects of the ACT's cultural or natural history Criterion D (Representative): importance in demonstrating the principal characteristics of a class of cultural or natural places or objects.	• As the first industrial manufacturing facility commissioned/constructed for the ACT. • As the source of bricks for early construction, including Provisional Parliament House, Kingston Powerhouse and Hotel Canberra. • As a site that is reflective of different phases in the construction of Canberra (1920s, and post-World War II), through the presence of six extant kilns and their subsurface flues. • For the relatively rare Staffordshire and Hardy patent kilns, with the Staffordshire Kiln (with its complex system of dampers and flues) the only known remaining Australian example of its type. • As a representative and unusual example of a large-scale, twentieth century urban brickworks, including buildings, structures, site layout and archaeological remnants. • For archaeological remains of the experimental plant which is linked to early construction of Canberra, allowing early brick makers to experiment with the brick production process and kiln construction, and providing the means to manufacture the bricks for the construction of the Staffordshire Kiln and the Kingston Powerhouse. (*This was updated by GML following the Archaeological Report 2022*). • Geological significance as the type locality for the Yarralumla Formation, a major sedimentary sequence dating from the Silurian Period, 424-423 million years ago.1 The rock units at the site provide the reference section for comparison of other outcrops within the Yarralumla Formation, and can be used for research and teaching. The railway remnants are important: • As evidence of the bulk transportation of bricks, particularly during the period of expansion from 1923 to 1927. • As a relatively rare remnant of Canberra's former rail network.

Criterion	Summary of Significance
Criterion C (Research potential of archaeological remains): potential to yield important information that will contribute to an understanding of the ACT's cultural or natural history	• Potential of archaeological remains to yield information about the operations of the Brickworks, specifically the operation of the experimental kilns and the subsurface flue components. • Potential to yield information about the construction, nature and configuration of the railway (*noting that this is not indicated in the Register Entry; and that nil-low archaeological potential was identified following the GML Archaeological Excavation Report 2022*).
Criterion E (Aesthetic importance of the Brickworks): importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT	• As a distinctive industrial landscape, through the combination of robust and dramatic building forms, structures, larger elements of equipment, dominance of brick and corrugated iron and the visual qualities of the quarry (open space and exposed rock outcrops). • For the low setting of the site within the landscape. • For the landmark quality of the 1953 brick stack.
Criterion G (Association with the ACT community): has a strong or special association with the ACT community or a cultural group within the ACT for social, cultural or spiritual reasons.	• The Brickworks holds strong associations with the local Yarralumla community. • Canberra Reds (brick type) are sought after as a building material (*indicated in the CMP, but not included in the Register Entry*).

It is noted that the CMP (GML, 2021a) found that the brickwork production process and railway remnants did not meet the threshold for Criterion F as, while the kilns demonstrate technical processes, they do not display innovation or technical achievement (Lovell Chen, 2022, see Appendix F36 in **Appendix F**).

Table 17.2 below outlines the individual elements listed as 'Features Intrinsic to the Heritage Significance of the Place' under the ACT Heritage Register. Numbers 24 to 38 have been identified in addition to those listed in the ACT Heritage Register.

It is important to note that the ACT Heritage Register citation for the Yarralumla Brickworks includes a grading of heritage significance – Schedule 1: Elements of 'Exceptional Significance', referred to as 'core elements' (red) and Schedule 2: Elements of 'Moderate Significance', referred to as 'supporting elements' (blue). These elements have been included in the CMP (GML, 2021a).

Table 17.2 Elements Listed Within the ACT Heritage Register and the CMP

Number	ACT Heritage Register Intrinsic Features: Core and Supporting	Naming used in the CMP for Individual Historic Elements
1	Kiln – Staffordshire (1915)	Staffordshire Kiln
2	Fan House for Staffordshire Kiln (1915)	Fan House for Staffordshire Kiln
3	Kiln – Hardy-Patent (1927)	Hardy Patent Kiln 1
4	Fan House for Hardy Patent Kiln 1 (1953)	Fan House for Hardy Patent Kiln 1
5	Hardy Patent Kiln (1953)	Hardy Patent Kiln 2
6	Kilns – Downdraft a, b, c (1963)	Downdraught Kilns
7	Chimney Stacks for Staffordshire Kiln (1915)	Chimney Stacks for Staffordshire Kiln

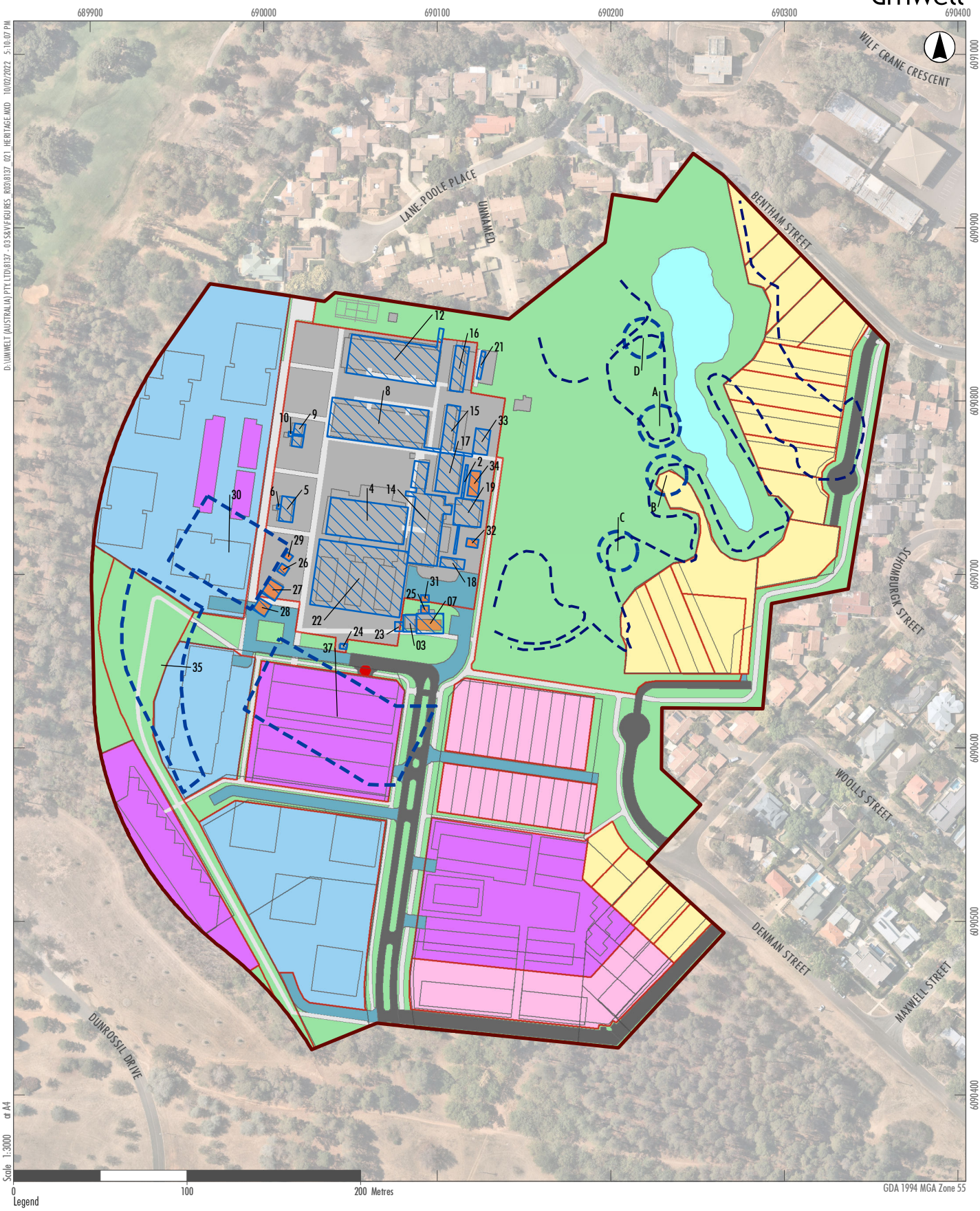
Number	ACT Heritage Register Intrinsic Features: Core and Supporting	Naming used in the CMP for Individual Historic Elements
8	Chimney Stack for Hardy Patent Kiln (1927)	Chimney Stack for Hardy Patent Kiln 1
9	Chimney Stack for Hardy Patent Kiln (1953)	Chimney Stack for Hardy Patent Kiln 2
10	Chimney Stack for Downdraft Kiln (1963)	Chimney Stack for Downdraft Kilns
11	Quarry	Quarry
12	Geological features A, B, C, D	Geological features in the Quarry
13	Office (1916)	Offices
14	Power House (1915)	Power House
15	Machine Bay 1 for Staffordshire Downdraught Kilns (1955)	Machine Bay 1 for Staffordshire Kiln Downdraught Kilns
16	Machine Bay for Hardy-Patent (1955)	Machine Bay 2 for Hardy Patent Kiln 1
17	Machine Bay for Hardy-Patent (1955)	Machine Bay 3 for Hardy Patent Kiln 2
18	Workshop (1955)	Workshop
19	Large Crusher House (1955)	White Pan Room (Large Crusher House/Crusher House II)
20	Primary Crusher House (1955)	Primary Crusher House (Crusher House III)
21	Small Crusher House	Small Crusher House (Crusher House I)
22	Elevator Conveyor (1955)	Elevator/Conveyor
23	Remains of the Brickworks Accommodation Village	Remains of the Brickworks Accommodation Village
24	-	Concrete retaining wall
25	-	Amenities Block
26	-	Downdraught Kilns Control Room
27	-	Toilet Block
28	-	Ancillary Storage Building
29	-	Substation/Control Room
30	-	Boiler House
31	-	Amenities Block 2
32	-	Extrusion Plant (Remnants)
33	-	Ancillary Storage Building 2
34	-	Storage Shed
35	-	Model Railway Workshop
36	-	Model Railway Storage Shed
37	-	Original brickyard (first)
38	-	Brickyard 2 (second)
1A	Yarralumla Brickworks Railway Remnants	Railway Remnants Registration Area

Detailed descriptions of these heritage elements are provided in Section 3 of the CMP (refer to Appendix F38 of **Appendix F**)**.**

Following the closure of the site in 1976, the structures have been used for ad hoc purposes and are in various states of repair. Overall, the Brickworks is in poor condition as it has been unused and untenanted for several years (GML, 2021a). Individual elements range in condition from 'poor' or 'reasonable' to 'good' condition. Many of the elements retain their important features but all need conservation action and maintenance due to lack of use, structural deterioration, water ingress, weather, vegetation overgrowth and vandalism.

Despite this poor condition, the Proposal Area has long been identified as a place of non-Aboriginal archaeological potential (Lovell Chen, 2022). Archaeological assessments undertaken in 2016 identified 12 areas of archaeological sensitivity and recommended that areas of moderate and high archaeological potential be subjected to an archaeological testing programme prior to any works or development in these areas (Lovell Chen, 2022).

Archaeological investigations were undertaken in 2021, informed by an Archaeological Research Design (GML, 2020). The results of these investigations are further discussed in **Section 17.3.**



Legend

- Proposal Area
- Apartment Typology
- Heritage Precinct
- Single Dwelling Block with Community Title Scheme
- Single Dwelling Lots
- Terrace Typology
- Open Space
- Water
- Community Title Road / Driveway
- Public Carpark Entry
- Public Roads
- Shared/Footpath
- Structures to be Demolished
- Property Boundaries

Heritage

- Areas
- Structures

Id

1 Quarry
2 Concrete Retaining Wall
3 Power House
4 Staffordshire Kiln (Kiln 1)
5 Fan House for Kiln 1
6 Chimney Stack for Kiln 1
7 Offices
8 Hardy Patent Kiln (Kiln 2)
9 Fan House for Kiln 2
10 Chimney Stack for Kiln 2
11 Amenities Block
12 Hardy Patent Kiln (Kiln 3)
13 Chimney Stack for Kiln 3
14 Machine Bay - Kiln 1
15 Machine Bay - Kiln 2
16 Machine Bay - Kiln 3
17 Workshop
18 Small Crusher House
19 White Pan Room
20 Primary Crusher House
21 Elevator/Conveyor
22 Downdraft Kilns (3x)
23 Downdraft Kiln Control Room
24 Chimney Stack for Kilns
25 Toilet Block
26 Ancillary Storage
27 Substation/Control Room
28 Boiler House
29 Amenities Block 2
30 Extrusion Plant (Remnant)
31 Ancillary Storage 2
32 Storage Shed
33 Model Railway Workshop
34 Model Railway Storage
35 Railway Remnants
36 The Brickyard
37 Former Workers Accomodation

FIGURE 17.1

Heritage Features

Photo 17.1 Downdraught Kilns (, 2020)

Photo 17.2 Chimney Stack for Hardy Patent Kiln 2 (Umwelt, 2020)

17.2.3 Natural Heritage

The brickpits within the Proposal Area are noted within the Statement of Significance for the 'Yarralumla Brickworks', for their historical value as a primary source of clay and also for their considerable geological value. As described in **Section 15.0** of this EIS, the geological formation of the quarry demonstrates the key characteristics of the Yarralumla Formation, which was formed from deep water sediments (mudstone and siltstone) of the early Silurian age (424-423 million years ago) and shale.

Four sites within the brickpits (known as sites A, B, C and D as shown on **Figure 17.1**) are known to possess exceptional geological significance (Geological Society of Australia (GSA), 2013). These sites have geological value as a reference section and type locality for the Yarralumla Formation (i.e., the place for which the broader stratigraphic rock units are named). The brickpits at Yarralumla were identified as the type locality for the Yarralumla Formation as early as 1954.

Sites A and D show excellent examples of an anticline in calcareous siltstone, Site B shows a typical tuffaceous mudstone and siltstone of the Formation and Site C shows abundant fossils of mainly brachiopods, with rarer preserved trilobites, coral and a simple crinoid.

The Yarralumla Formation is the only fossil marine unit within the extensive volcanic marker horizons of South Canberra. The fossils provide information about the shallow, warm-water, marine environment and climate at the time when brachiopods, trilobites, corals and crinoids were common in this part of eastern Australia. Easy access and exposure of the formation at the Yarralumla brickpits make the site suitable for scientific study, which contributes to the value of the site.

The GSA (2013), has noted the good state of preservation of the Proposal Area, and has recommended its use for scientific and educational purposes.

17.3 Investigations

Numerous heritage investigations have been undertaken at the CBP in relation to the redevelopment proposal. Studies of relevance are listed below:

- Canberra Brickworks Conservation Management Plan (Lovell Chen, 2010), prepared for the Land Development Agency (refer to Appendix F33 in **Appendix F**).
- Canberra Brickworks Yarralumla, Stage 1 Aboriginal Cultural Heritage Assessment (Navin Officer Heritage Consultants Pty Ltd, 2014), prepared for the Land Development Agency (refer to Appendix F34 in **Appendix F**).
- Canberra Brickworks Conservation Development Strategy (Lovell Chen, 2015), prepared for the Land Development Agency (refer to Appendix F35 in **Appendix F**).
- Canberra Brickworks – Geotechnical Investigations Statement of Heritage Effects (GML, 2019) (Appendix F37 in **Appendix F**), prepared for Doma Group.
- Canberra Brickworks Precinct Conservation Management Plan Final Draft Report Vol 1 & 2 (GML, 2021a) (Appendix F38 in **Appendix F**), prepared for Doma Group.
- Canberra Brickworks Precinct Archaeological Research Design (GML 2020) (Appendix F39 in **Appendix F**), prepared for Doma Group.

- Canberra Brickworks Development—Blocks 1, 7, and 20, Section 102, Yarralumla Backfilling of Old Quarry Area—Geotechnical Fossil Study (ACT Geotechnical Engineers Pty Ltd, 2021a) (Appendix F48 in **Appendix F**), prepared for Doma Group.
- Draft Canberra Brickworks Quarry: Statement of Heritage Effect (GML, 2021b) (Appendix F49 in **Appendix F**), prepared for Doma Group.
- Yarralumla Brickworks Heritage Impact Statement (Lovell Chen, 2022) (Appendix F36 in **Appendix F**), prepared for Doma.
- Canberra Brickworks Precinct: Archaeological Excavation Report and Statement of Heritage Effects Vol 1 and 2 (GML, 2022a) (Appendix F58 in **Appendix F**), prepared for Doma Group.
- Canberra Brickworks Precinct: Artefact Management Strategy (GML, 2022b) (Appendix F59 in **Appendix F**), prepared for Doma Group.

17.3.1 Archaeological Investigations

As aforementioned, an Archaeological Assessment (AA) of the Proposal Area was prepared in 2016 (Navin Officer Heritage Consultants Pty Ltd with Lovell Chen Architects & Heritage Consultants) and identified 12 areas of archaeological sensitivity and recommended that areas of moderate and high archaeological potential be subjected to an archaeological testing program prior to any works or development in these areas (BRW1–BRW12). An Archaeological Research Design (ARD) (Appendix F39 in **Appendix F**) was subsequently prepared in April 2020 to guide the historical archaeological investigations required to manage and mitigate construction related impacts. The ARD includes a preliminary archaeological testing program which aimed to determine the nature and extent of archaeological deposits within the Proposal Area and to develop recommendations for any future management requirements for archaeological deposits.

Based on a review of the AA and an inspection of the Proposal Area, GML determined that eight of the 12 areas of archaeological sensitivity identified should be subjected to further archaeological testing (BRW1, BRW2, BRW3, BRW7, BRW8, BRW10, BRW11 and BRW12). The proposed methodologies for archaeological testing at these areas are presented in the ARD. The ARD was subsequently submitted with an Excavation Permit application under Section 61E of the *Heritage Act 2004*. This application was approved on 14 September 2020. These works have been completed.

An Archaeological Excavation Report and Statement of Heritage Effects (GML, 2022a, see Appendix F58 in **Appendix F**) (AER) has been prepared, outlining the outcomes of the archaeological test excavations carried out in accordance with Excavation Permit Yarralumla-S102-B1. The archaeological investigations identified evidence for the 1913 -c1916 ‘experimental plant’ (BRW8). This comprised the remains of five early kilns, including the modification of two downdraught kilns into Scotch kilns. Although previously considered to be a temporary part of the Brickworks, the modification of these two kilns to continue operations show an active investment in the longevity of the experimental plant.

Based on the AER, the predicted archaeological potential of the identified areas has been updated, as summarised in **Table 17.3** below. Further detail is provided in Section 5.2 of the AER (GML 2022a).

Table 17.3 Updated Archaeological Potential of BRW Areas (GML, 2022a)

Area	AA (2016)	AER (2022)
BRW1 – Building platform and concrete features	Moderate archaeological potential	Nil archaeological potential
BRW2 – Married quarters and Brickworks Hostel	High archaeological potential	Moderate archaeological potential
BRW3 – Area of postholes and other remains	High archaeological potential	Low archaeological potential
BRW4 – Single men's quarters	Low archaeological potential	Not investigated
BRW5 – Clay feature and rubble	Low archaeological potential	Not investigated
BRW6 – Rubble heap/refuse dump	Low archaeological potential	Not investigated
BRW7 - Quarry	High archaeological potential	High archaeological potential
BRW8 – Old kiln and dormitories	Low archaeological potential	High archaeological potential
BRW9 – Cottage, stables, coal store	Low archaeological potential	Not investigated
BRW10 – Railway remnants	Moderate archaeological potential	Low archaeological potential
BRW11 – Railway siding extension	Moderate archaeological potential	Nil archaeological potential
BRW12 – Flues and subsurface workings	High archaeological potential	High archaeological potential

An assessment of significance of these archaeological remains (GML, 2022a) found that only areas BRW8, BRW10 and BRW12 met the heritage significance criteria:

- BRW8 was assessed as meeting criteria a), b), c), and d). The archaeological remains in this area are highly significant.
- BRW10 was assessed as meeting criteria a) and b). The archaeological remains in this area are moderately significant.
- BRW12 was assessed as meeting criteria a), b), c), d), e), and f). The archaeological remains in this area are highly significant.

The AER concluded that the proposed development would have nil to negligible impact on all investigated areas except for BRW8, where there would be severe impacts on significant remnants of the 'experimental plant' (Lovell Chan, 2022, see Appendix F36 in **Appendix F**). Methods for managing these impacts included a recommendation that the findings of the excavation be interpreted and presented to the public, and that works in this area be monitored for the potential presence of additional kilns. This is further discussed in **Section 17.4** and **Section 17.5** below. The Proponent is committed to working with and seeking approval from the ACT Heritage Council to determine the most appropriate way to interpret and potentially adaptively reuse the materials found at BRW8.

Following completion of this work, the CMP (Appendix F38 in **Appendix F**) was updated (GML, 2021a), with an inventory of individual elements provided at Appendix A of the CMP. The inventory provides conservation guidance for intrinsic features that are core and supporting elements of the site's heritage significance. An inventory of Moveable Relics is also provided in Appendix H of the CMP.

17.3.2 Revised Conservation Management Plan

Several iterations of the Canberra Brickworks CMP have been prepared since 2017, with revisions being made as further investigations have been carried out and as a result of feedback from ACT Heritage Council. Approval for the CMP was received by the ACT Heritage Council in August 2021 (Appendix F38 in **Appendix F**).

The CMP was prepared in accordance with the provisions of the *Heritage Act 2004*. The CMP is a revision of the document originally prepared by Lovell Chen in 2010 (refer to Appendix F33 in **Appendix F**). The 2010 CMP required updating to:

- Address changes made to the ACT heritage legislation since the 2010 CMP was prepared.
- Include the associated Railway Remnants heritage place (listed on the ACT Heritage Register in 2013).
- Provide an update of the condition of the site and its elements.
- Understand the site in the context of the proposed redevelopment to allow the ongoing use of the site.

The CMP provides a review and reassessment of the heritage significance of the Canberra Brickworks and Railway Remnants and identifies the elements and features intrinsic to this heritage significance. The CMP notes that the significant places that were assessed by the 2010 CMP "are largely correct" (GML, 2021a), with some additional detail required in some of the assessment statements against criteria. This is in particular reference to the categorisation of elements of the CBP as either 'Core', 'Supporting' or 'Incidental' elements that contribute to the heritage significance of the site.

The CMP also confirms that the site does not meet the threshold for National Heritage listing.

The CMP provides a useful framework for the ongoing management of the CBP, detailing its conservation policies, actions, and implementation schedule. This is further discussed below. The CMP is attached to this EIS in Appendix F38 of **Appendix F.**

17.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for heritage in **Section 17.1** above, the potential impacts of the proposed redevelopment of the CBP relating to heritage may be characterised as:

- Inappropriate design choices which are not consistent with the heritage significance of the Proposal Area and the approved CMP.
- Damage to heritage items due to construction activities and earthworks.
- Damage to heritage items or reduced heritage significance due to ongoing residential and recreational use of the Proposal Area.
- Impact upon/damage to the Yarralumla geological formation due to construction and landscaping works.

The two ACT Heritage Register listings for the 'Yarralumla Brickworks' and the 'Railway Remnants' require that any proposed works should be assessed for potential impacts on the heritage significance of the place.

Under Section 61H of the *Heritage Act 2004* a Statement of Heritage Effects (SHE) is required. Two SHEs have been prepared to date—for the proposed Masterplan and Development Design Strategy (2017) and for the Geotechnical Investigations (2019) (Appendix F37 in **Appendix F**). A revised SHE and further individual SHEs would be prepared as the design progresses for individual, staged development across the Proposal Area. A Heritage Impact Statement (Lovell Chen, 2022) has also been prepared for the Proposal.

17.4.1 Design Impacts

The adaptive reuse of the Canberra Brickworks has the potential to result in both minor and major additions to core and supporting elements of the heritage significance of the site. In particular, there is the potential for the proposed design to result in the following impacts:

- Additions may detract from or diminish an element's cultural significance and be unsympathetic to its character through poor choice of style and form.
- Additions may dominate the existing element by being unsympathetic to its scale and bulk.
- Additions may visually dominate the existing element by adding to a more significant or prominent elevation.
- Removal of key heritage features may diminish an element's cultural significance.

The heritage significance of the Proposal Area has been a central consideration in the overall design of the proposed redevelopment, with potential impacts carefully analysed and balanced alongside the drive to reactivate this important and challenging site in the context of conservation, stabilisation and restoration actions.

The approach to the redevelopment centres on the industrial heritage of the site and facilitates the full reactivation of the Proposal Area, its built heritage elements, the quarry and Railway Remnants. It also engages with the community through publicly accessible areas. The Proposal aims to conserve, redevelop and integrate the heritage elements into a distinctive cultural precinct.

The reactivation of the Proposal Area would retain and enhance the narrative of the CBP as an early industrial complex, allowing the community to appreciate the brick manufacturing process from its commencement at the quarry face, through the journey of the materials through the firing process in the kilns, quality testing, and ultimate distribution to construction sites around central Canberra, initially via narrow gauge rail and later by road. This vision is the desired design interpretation outcomes for the Proposal.

The Heritage Impact Statement (Lovell Chen, 2022, see Appendix F36 in **Appendix F**) lists all buildings / structures within the Proposal Area, summarises the relevant policies from the CMP and comments on the compliance of the Proposal with this guidance. This has been summarised in **Table 17.4** below. The Proposal has been found to have a high degree of compliance with the CMP.

It was noted that a degree of change to the fabric and setting of the Proposal Area is necessary. This will include alterations, additions, new built form and new approach to landscaping, lighting and wayfinding across the Proposal Area. This change in use will ultimately alter the ability of the Proposal Area to be understood as a former brickworks (Lovell Chen, 2022). However, these impacts have been mitigated and minimised through a variety of design strategies. This is further discussed in **Section 17.5.1**.

Table 17.4 Impacts and Consistency with CMP Policies for Specific Elements (Lovell Chen, 2022)

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
1: Staffordshire kiln	Exceptional	Core	Retain original external fabric and restore brickwork. Internal adaptation is acceptable, provided that a representative example of a kiln chamber and a section of the firing floor are retained. Retain the form of kiln entries (allowing for introduction of recessed doors). Ensure new structures reference the industrial character of the place. Minor exterior changes are acceptable including new roof lights, solar panels or other ESD measures.	The proposal is to retain and adapt the Staffordshire Kiln for use as a wellness centre, with associated hospitality and retail spaces. Most of the original brickwork and kiln forms (16 of 20) at ground level will be retained. Level 1 walls and roof will be rebuilt to contemporary standards, retaining the original roof form and detail, with new corrugated metal cladding and new window openings. New built form will be inserted to the north (a glazed ground level café) and south (a two-storey glazed structure linking to two of the downdraught kilns), to create new spaces and access points. The works will involve impacts on both original and non-original fabric, extensive internal change, and changes to the setting and external presentation of the kiln. However, these impacts are necessary to support the proposed new uses and will be minimised by: • Retaining the form and materiality of the building. • Retaining and conserving original brickwork at ground level and where present at level 1. • Careful and respectful design of new structures, with attention to materials, form, bulk and the connection between old and new fabric. • Retention of distinctive interior and exterior qualities where possible, including kiln firing holes and firing marks, roof trusses and overhead equipment, brick details and kiln numbers. • Use of lighting, ground plane treatments and signage to interpret and celebrate the history and operation of the kiln. Overall, the proposal is a balanced outcome that is consistent with the CMP policies and Register Entry, and will provide for the ongoing conservation of the kiln structure.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
1A: Railway Remnants	Significant	Core	Retention as an open landscaped space that reflects its origins through the form of embankments and earth terraces. Adaptation of this area should ensure legibility as a former railway. Note contents of ACAT Orders (2013) that the zone shall be treated as landscaped open space, celebrating the history of the railway remnants.	The proposal is for retention of the area as landscaped open space, with a strong interpretive dimension. It is noted that there is very little remnant fabric or archaeological potential associated with the railway remnants. The landscape treatment will retain and reinforce the cutting alignment. Interpretive signage, furniture and play structures will respond to the history of the railway remnants, and their significance as a point of departure and connection to major built landmarks in Canberra (such as the Provisional Parliament House). This proposal is consistent with the CMP policies and represents a positive heritage outcome.
2 Fan house for Staffordshire kiln	Exceptional	Core	Retain original form, openings, fabric, internal configuration and concrete platforms. New removable flooring could be introduced to facilitate use of the space. Replace deteriorated fabric to match or be complementary to existing materials. Investigate and address water ingress. Investigate possibility of retention of fan function or elements.	The proposal is for retention and conservation of the Fan House. Decayed fabric will be replaced in a like-for-like manner, water ingress will be addressed, the roof will be re-built to meet current standards and doors will be installed to ensure the building is secure and weather-tight. The potential for the introduction of a new floor will be explored to facilitate future use. This proposal will have some heritage impacts including demolition of early fabric and impact on the ability to perceive the connection with underground flues. However, these changes are necessary given the extent of decay and the need to secure a sustainable new use. Measures to minimise impact including retaining the original form, openings and fabric where possible, replacing decayed fabric to match or complement existing and exploring options for retention of some extant, fragmentary equipment. Overall, the proposal is consistent with CMP policies and represents a positive heritage outcome.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
3 Hardy-Patent kiln 1	Exceptional	Core	Retain, conserve and stabilise external original form and fabric (brick), replacing (or refixing) wall and roof sheeting. External modifications (including new first floor openings, windows, recessed doors) are anticipated. The verandah should be retained or re-interpreted to reference the original. Internal modifications including carefully designed subdivisions in the kiln chambers and installation of concrete slab are anticipated; if possible, roof trusses should be retained/exposed.	The proposal is for the adaptation of Hardy Patent Kiln I for new hospitality and commercial uses. The building's external form and original brickwork at ground level will generally be retained and conserved. The verandah will be replaced with a new awning structure and the recessed glass doors will be introduced. The upper-level metal clad walls and roof will be replaced, with the addition of windows, roof lights and vents to support the new use. A new elevated catwalk will be inserted to the south (eastern end), east and north of the building. Internally a limited number of carefully designed new openings will be inserted in the wall dividing the two kiln chambers and finished in a way that is visually differentiated. Floors at ground and level one will be excavated with new concrete slab floors installed. The proposal will result in heritage impacts including changes to original fabric, the external appearance and the setting of the kiln. However, the changes are necessary to support a sustainable new use for the kiln, and are limited in line with CMP guidance, so that the history of the use of the kiln will be legible in the new development. Minimisation and mitigation measures include retention and conservation of most of the original brickwork and roof trusses, design of modifications and additions to be respectful and complementary to original fabric and form, and interpretation to support continued understanding of the history and operation of the kilns. Overall, the proposal is a balanced outcome that is consistent with the CMP policies and Register Entry and will provide for the ongoing conservation of the kiln structure.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
4: Fan house for Hardy-Patent kiln I	Exceptional	Core	Retain and stabilise in-situ, retaining the internal configuration as evidence of the original function of the building. No new openings should be introduced. Substantially dismantled plant could be retained or removed and recorded.	The proposal is for retention and stabilisation of the Fan House. Cladding that cannot be refixed will be removed, and timber framing, windows and openings will be repaired. Ductwork and remnant machinery will be retained. The proposal is consistent with the CMP and Register Entry and represents a positive heritage outcome.
5: Hardy Patent Kiln II	Exceptional	Core	Policies are comparable with the policies for Hardy Patent Kiln I (see above).	The proposal is broadly similar to the proposal for Hardy Patent Kiln I, including retention of original brickwork, rebuilding of upper walls and roof with new openings, replacement of verandah structure and internal demolition (limited openings between kiln structures, and excavation of the firing floor). These interventions will support the introduction of new specialty retail and commercial uses. As for the analysis of the Hardy Patent Hardy Patent Kiln I proposal, while the proposal involves loss of fabric and change to presentation and of understanding of the operation of the kiln, this is a balanced outcome that includes minimisation/mitigation measures, including retention of the building's overall form, conservation of original fabric where possible and design of complementary alterations and additions, supported by interpretation. The proposal is consistent with the policies of the CMP and Register Entry and is necessary to introduce a new viable use to the place.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
6: Downdraught Kilns	Exceptional	Core	The enclosing shed roof structure could be retained or demolished as required. Adaptive reuse should be explored, including internal subdivision.	One of the downdraught kilns will be retained and adapted for a hospitality (bakery/café) use, with the remaining two connected to the Staffordshire Kiln to the north to be adapted for use a wellness centre. Interventions include demolition of the shed, installation of new metal roofs to a complementary design, introduction of lightweight internal partitions and new glazed north and south openings and fresh air louvres (with existing metal doors fixed open and retained). Existing vertical steel beams and tensioned cables are to be retained where possible. Opportunities will be explored to remove the infill from feedholes, stabilise the brick and install a new steel lintel and window, to allow natural light into the kilns.
7: Chimney Stack for Staffordshire Kiln	Exceptional	Core	Element should be retained and conserved.	The proposal is for retention, stabilisation and conservation. This is consistent with the CMP and represents a positive heritage outcome.
8: Chimney stack for Hardy- Patent kiln I	Exceptional	Core	Element should be retained and conserved.	The proposal is for retention, stabilisation and conservation. This is consistent with the CMP and represents a positive heritage outcome.
9: Hardy-Patent kiln 2 chimney stack	Exceptional	Core	Element should be retained and conserved.	The proposal is for retention, stabilisation and conservation. This is consistent with the CMP and represents a positive heritage outcome.
10: Chimney Stack for Downdraft Kiln	Exceptional	Core	Element should be retained and conserved.	The proposal is for retention, stabilisation and conservation. This is consistent with the CMP and represents a positive heritage outcome.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
11 and 12 Quarry and geological features A, B, C and D	Exceptional	Core	Retain as a landscape element that reflects in its form and presentation its origins as an excavated brick pit. Retain and protect identified geological features (rock outcrops).	The proposal is to develop the Quarry as a public park, with a range of landscape features, including an interpretive water feature linking to the Brickyard. Housing will be located on the elevated areas to the south and east. Limited excavation and fill works are proposed generally to the east of the quarry. The proposal retains the quarry with large areas of the excavated brick pit to be exposed. Excavation and fill works are limited and will avoid significant geological features. Archaeological Investigations of the area to be disturbed (GML, 2022a) found that while there are archaeological deposits, they are of no heritage significance (and consequently, do not represent a heritage impact). The proposed landscape design for Pittman Park will enable public access to the area and interpretation of historical and geological significance of the quarry. The proposal complies with the CMP policies and will result in a positive heritage outcome.
13: Office **14: Power House**	Moderate	Supporting, but c1953 and 1970s extensions are incidental	Buildings could be adapted internally, with remnant equipment in the Power House retained or removed as required. 1953 and 1970s extensions are not significant and could be removed. Remove intrusive ad hoc additions, and consider repairing and reinstating infilled openings (doors and windows) if required.	The proposal is for the removal of later additions and adaptation of these buildings for the provision of concierge (and possibly retail) uses. While the final design is not resolved, the proposal will include demolition of non-significant (incidental) extensions, replacement of doors and windows in existing openings and internal demolition including removal of equipment. The proposal may include the introduction of lower scale and sympathetically designed additions (such as glass walkway connection or low scale addition to the north of the Office). While there may be some minor impacts associated with demolition, the result will, on balance, be positive and is consistent with the CMP. It will result in retention of the buildings, removal of intrusive additions and the introduction of a sympathetic new use.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
15: Machine Bay I **16: Machine Bay I** **17: Machine Bay I** **18: Workshop** **19: Large crusher house / White Pan Room** **20: Primary crusher house**	Moderate	Supporting	These buildings are all of moderate/supporting significance and have broadly similar adaptation policies: There is scope for external modification (including windows and other openings to allow for adaptive reuse) and internal adaptation. Remnant conveyors platforms, hoppers and walkways could be retained or replaced with new development that is generally consistent with the industrial character of the place.	The proposed approach for the adaptation of these buildings will result in a significant degree of internal change and smaller scale glazed extensions, while retaining the overall effect of the external cladding and roof forms of the buildings. The approach to adaptation of these buildings follows a similar set of principles: • the walls will be rebuilt to meet code requirements, including insulation and internal sheeting, but retaining/repairing/refixing external corrugated iron (original or salvaged material) • new rainwater goods will be installed to match existing, and opportunities to replicate external details (such as roof vents) will be explored • existing openings will be glazed and new external openings (doors and windows) in new metal frames will be inserted to support the adaptation of the space and need for access, ventilation and light • new 'glass box' steel and glazed extensions will be added to the east of the Machine Bays at level 1 • the gantry crane/conveyor that links the Machine Bays will be retained, and opportunities to retain existing upper level hoppers and other equipment, will be explored • lightweight internal walls will be inserted to support new uses • some areas of existing concrete slab and platforms will be retained and repaired, with new concrete slab inserted at new levels and extensions. This proposal represents a balanced approach, which is consistent with the CMP and register entry policies. Overall, the works will make a significant contribution to the retention of significance of the place, and the understanding of the Brickworks as a cohesive site.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
21: Small crusher house	Moderate	Supporting	-	The proposal is for retention, stabilisation and conservation. This is consistent with the CMP and represents a positive heritage outcome.
22: Elevator conveyor	Moderate	Supporting	-	The proposal is for retention, stabilisation and conservation. This is consistent with the CMP and represents a positive heritage outcome.
23: Remains of the Brickworks Accommodation Village	Moderate	BRW2 and BRW3 identified as high archaeological potential. Updated following AER (GML, 2022a)	-	The proposal is to develop this area to include residences (townhouses and apartments) and landscaping for amenity and services installation. BRW2 and BRW3 were included in archaeological investigations that took place in 2021 (GML, 2021). These investigations concluded that the proposed works would result in negligible impact to archaeological features. This was because, although archaeological features were identified in the area, they were assessed as having no significance (see also Chapter 7 'Impact Assessment' in GML, 2022a).
24: Concrete Retaining Wall	Not identified	Core significant at p.79, but not of heritage significance in Appendix A.	Not required to be retained—but where retained it should be stabilised. Model railway workshop and non-original wall could be demolished as required.	The proposal is largely for in situ retention with limited proposed demolition at the site of the former Model Railway Workshop, consistent with the CMP.
25: Amenities Block	Not identified	Incidental	Retain or demolish as required	Demolition of incidental elements is consistent with the CMP and does not present an impact on heritage significance.
26: Downdraught kiln control room	Not identified	Moderate significance at p.80, but not of heritage significance in Appendix A.	Retain or demolish as required	The proposal for demolition is consistent with the policy guidance contained in Appendix A of the approved CMP, that the control room could be retained or demolished as required. It is also noted that the control room is not a significant element in the Register Entry.
27: Toilet Block **28: Ancillary Storage Building**	Not identified	Incidental	Retain or demolish as required	Demolition of incidental elements is consistent with the CMP and does not constitute an impact on heritage significance.

Element	Register Entry	CMP 2021	CMP Policies	Impacts and Consistency with CMP
29: Substation / Control Room **30: Boiler House** **31: Amenities Block 2** **32: Brick Extrusion Plant (remnants)** **33: Ancillary Storage Building 2** **34: Storage shed** **35: Model railway workshop** **36: Model railway workshop**				
37 and 38 Brickyards	Not identified	Core	Retain and conserve as a landscape element New development is managed in a way that retains an understand of historic function Respect industrial character, massing, scale, form and orthogonal layout of existing buildings Repair or replace surfaces, avoiding impact on underground flues	The Brickyards will be largely retained as open space, with addition of lower-scale built form to enable circulation and provide a new café space to the north of the Staffordshire Kiln. There will also be extensive landscaping, which is of a low scale, including the introduction of hard and soft elements and a new interpretive water feature. New development will frame this space as central to the experience of the revitalised Brickyards and will be a key location for interpretation and enjoyment of historic structures. There will be some impacts relating to the transformation of the setting of kiln structures from a starkly industrial, to a softened environment. This approach can, however, be justified to adapt these new spaces to the needs of people and the realities of Canberra climate. Impacts will be minimised through a recessive and respectful design approach that showcases heritage buildings, employs complementary materials and incorporates interpretive elements. The approach is consistent with the CMP and represents a positive heritage outcome.

The Proponent notes that ACT Heritage Council have requested detailed plans and documentation for all components that may damage significant fabric and diminish heritage values. However, the Concept Design requires finalisation, meaning that some of the specific design impacts of the Proposal remain uncertain. However, the Proponent commits to ensuring all work is carried out in accordance with the CMP (GML, 2021a) and with the approval the ACT Heritage Council, in accordance with the requirements of the *Heritage Act 2004*. The Proponent has established a number of design principles that are to ensure the heritage significance of the Proposal Area is appropriately interpreted and celebrated within the final design. These are further outlined in **Section 17.5.1.**

As the Proposal proceeds through the approval process, further SHEs would be prepared as the design progresses for individual, staged development across the Proposal Area. Future SHEs would require statutory approval by ACT Heritage Council and would address more detailed aspects of the redevelopment at the DA assessment stage (e.g., elevations, colours and materials proposed for use in construction). A critical component of future individual SHEs would be to describe, assess and document reasonably practicable alternatives and measures to minimise heritage impacts, should unavoidable impacts to heritage places and objects be identified. The suitability of the design of each individual, staged development, would also be assessed in further detail and would require approval form the ACT Heritage Council.

The Heritage Impact Statement concludes that the design of the Proposal achieves a high degree of compliance with the policy contained in the CMP and Heritage Register Entry and includes a significant commitment to minimisation and mitigation of impacts on heritage significance across the site (Lovell Chen, 2022). Further discussion is provided in **Section 17.5.1**.

17.4.1.1 Impacts to Areas of Archaeological Significance

BRW8 – Old kiln and Dormitories

According to the AER (GML, 2022a, see Appendix F58 in **Appendix F**), BRW8 was found to have four of the six kilns associated with the 1913 – 1916 experimental plan, plus an additional clamp kiln. The remains of these kilns are generally fragmentary, but certain features had been well preserved. The Proposal would impact this area through the construction of five townhouse and associated landscaping for amenity and services installation (GML, 2022a). This is considered to be a severe impact to these archaeological features (GML, 2022a).

A number of mitigation measures have been recommended within the AER (GML, 2022a) and Heritage Impact Statement (Lovell Chen, 2022). The Proponent is committed to adopting these measures in order to minimise impacts to the heritage and archaeological significance of the Proposal Area. These measures are further discussed in **Section 17.5.**

BRW10 – Railway remnants

Investigation in this area identified two remnant railway cuttings and central embankment. No evidence of associated railway infrastructure was identified. The proposed works in this area would comprise of landscaping for amenity and provision of public space. As noted in the AER (GML, 2022a), there may be impact to unidentified archaeological features. The exact nature of the landscaping works has yet to be finalised.

The Proposal seeks to retain this area as landscaped open space with a strong interpretive dimension (Lovell Chen, 2022). It is noted that there is very little remnant fabric or archaeological potential associated with the railway remnants. Management and mitigation measures including the use of interpretative signage and designing furniture and play structures to respond to the history of the railway remnants and their connection to major built landmarks in Canberra. The proposal is considered to have a positive heritage outcome (Lovell Chen, 2022).

BRW12 – Flues and subsurface workings

Investigation in this area identified that the Staffordshire Kiln flues are in good condition and the Downdraught Kilns flues are in poor condition (GML, 2022a). The subsurface flues of the Hardy Patent Kilns 1 and 2 could not be accessed, however, they are likely to still be largely intact and show similar conditions to the Staffordshire and Downdraught Kiln flues. There are no proposed works for this area. The flues would be made safe and retained in situ. The Proponent is committed to ensuring that these archaeological features are stabilised and remain safe.

17.4.2 Construction Impacts

17.4.2.1 Geotechnical Investigations

Prior to commencing construction, the Proposal would require further detailed geotechnical investigations. The potential impacts to heritage within the Proposal Area were assessed in the Canberra Brickworks – Geotechnical Investigations Statement of Heritage Effects (GML, 2019) (Appendix F37 in **Appendix F**). Further geotechnical investigations would involve the collection of soil samples from 45 boreholes across the CBP to assess soil conditions and characterise the nature of fill and waste materials in specific locations. In addition, four boreholes are to be converted to groundwater monitoring wells to supplement the five existing wells currently installed on the site.

The SHE concluded that the impacts to the heritage significance of the CBP as a result of the geotechnical investigations would be limited to some areas of high archaeological potential (refer to Figure 2.1 within the SHE contained in Appendix F37 in **Appendix F**), however, all other excavations are not considered likely to result in adverse heritage impacts.

Excavations within the 'Area of postholes and other remains' (BRW3) may impact on significant archaeological remains. Investigations within the footprint of the Brickworks facilities (BRW12) have some potential to impact the extant flues and subsurface workings of the kilns which are located beneath the courtyards. Although there is high potential for archaeological features with the quarry (BRW7), these features are not integral to its heritage significance however do have research potential. As a result, mitigation measures for works in these areas would be required (refer to **Section 17.5.2.1** below).

17.4.2.2 General Construction

Potential impacts that may occur to elements of heritage significance during the course of construction include:

- Disturbance to and/or destruction of known and unknown archaeological deposits.
- Unapproved demolition or works on buildings of heritage significance.
- Finding/disturbance to and/or destruction of unexpected heritage items.
- Structural damage to heritage buildings through vibration, e.g., movement of heavy vehicles and close proximity of demolition works.

An Unanticipated Finds Protocol has been developed and would be followed in the event that previously unrecorded or unanticipated archaeological material (objects, artefacts, deposits or relics) are encountered (Appendix F38 in **Appendix F**).

A Heritage Management Plan (HMP) would be prepared as a sub-management plan to the CEMP. The HMP would outline a range of management measures, in accordance with best practice, to ensure these potential construction impacts are mitigated. Such measures may include demarcating areas of archaeological potential and creating no-go zones. The Proponent commits to ensuring construction impacts to the Canberra Brickworks are appropriately mitigated, noting that the principal concept for the Proposal is to adaptively reuse and enhance the heritage significance of the Canberra Brickworks.

17.4.2.3 Damage to Yarralumla Formation

As outlined in Table 4.2 of the CMP (Appendix F38 in **Appendix F**), the Yarralumla Formation is considered to meet the ACT Heritage Significance Criteria. In particular, it contributes to the (a) importance to the course or pattern of the ACT's natural history, and (d) importance in demonstrating the principal characteristics of a class of natural place or environment.

The Proposal Area has experienced substantial historical disturbance through the use of the site as a brickworks. This is demonstrated in the presence of fill material, consisting predominantly of bricks (whole and fragments), with lesser amounts of concrete (slabs and fragments), ash material, reworked soil, and trace amounts of metal pipe, found across the Proposal Area. The fill material encountered during geotechnical investigations ranged in thickness between 0.1 m to 3.3 m (SMEC, 2016a) (Appendix F21 in **Appendix F**).

As such, it is likely that the Yarralumla Formation has already been substantially damaged from this historical use. Further geotechnical investigations are proposed to be undertaken prior to construction.

The fill material which was placed around the Proposal Area upon the closure of the operational brickworks is uncompacted, and prone to collapse upon disturbance. Therefore, removal of the fill is required to allow development. Areas proposed to be developed adjacent to the quarry cliffs also require additional fill to create a level and stable surface for development. **Figure 17.2** shows that cut and fill is proposed to occur in the north-east and east of the quarry near the geological formations. The areas shown in red contain existing fill which would be removed, and areas in green require additional fill to level the site. While these cut and fill works are not proposed to overlap with the four sites of significance in the formation, the works have the potential for indirect impacts on the geological formations if appropriate measures are not taken.

As described in **Section 15.0,** appropriate exclusion zones would be implemented around these significant geological formations. The area around site C would also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).

Excavations at the quarry have exposed the Yarralumla Formation. As a result, the Proposal Area is one of the only locations in Canberra from which the Yarralumla Formation can be closely observed. The Proponent has viewed this as an opportunity to celebrate Canberra's geological history, and so has included their interpretation into the design of the proposed Quarry Parklands. This has been discussed in **Section 9.0** and **Section 11.0** of this EIS.

As per item i)(a) of the Specific Requirements within the ACT heritage listing of the 'Yarralumla Brickworks', the existing quarry landform would be retained in a manner that demonstrates and celebrates the industrial use of the site and its geological history. Landscaping and access to the quarry would be sympathetic to the landform and utilise existing openings and gradients. Furthermore, disturbance of the immediate surface would be limited to works that protect, stabilise and enhance the interpretation of the Yarralumla Formation.

This approach is considered to be consistent with the site-specific advice published by the Geological Society of Australia (GSA, 2013).

17.4.3 Operational Impacts

Potential impacts that may arise during the operation of the Proposal include:

- Inappropriate use of the site that may damage the fabric of heritage elements and thereby diminish the heritage significance of the site.
- Inappropriate or ineffective management and maintenance of heritage elements.

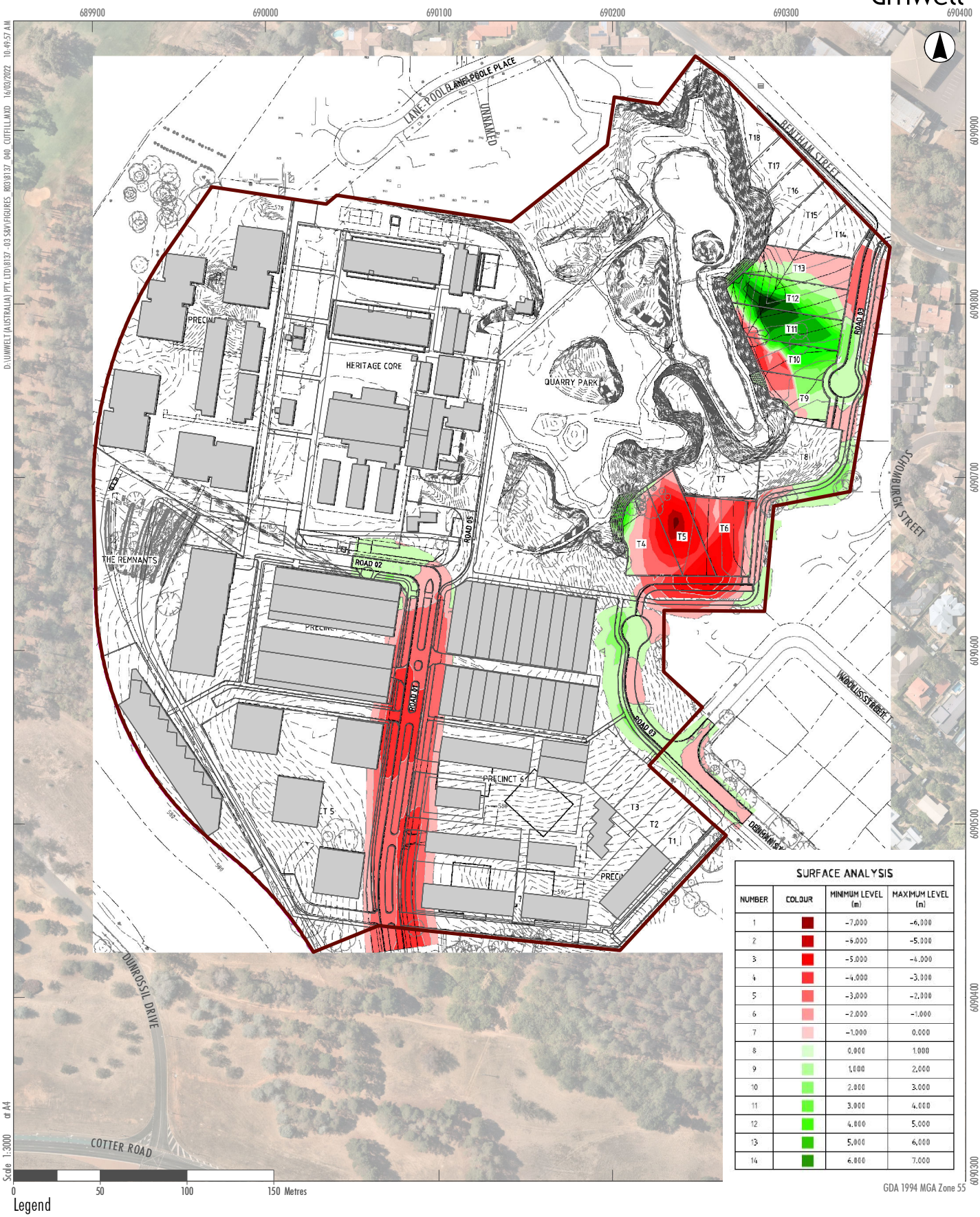
As noted in **Section 17.4.1**, the SHE determined that the adaptive reuse of the Proposal Area would have a positive heritage impact on the Brickworks. The adaptive reuse of the entire CBP, including the quarry and railway remnants, would provide a cohesive approach to 'whole of site' conservation, and interpretation of the site's former function.

Rather than the Proposal Area continuing to decline into a further state of disrepair, the revitalisation of the Brickworks provides an opportunity for ongoing conservation and interpretation of the site. As noted in the CMP, the site should continue to be managed with a clearly identified approach to the conservation of the significant elements of the Brickworks, and a cautious approach to any new work to ensure that the significance of the site is sustained.

The proposed design of the Quarry Parklands will also ensure that the existing geological formation will be publicly accessible, allowing for scientific and educational enquiry.

The use of individual heritage elements would be subject to further statutory assessment by ACT Heritage Council during the DA stage of the Proposal. As outlined in **Section 17.4.1** above, subsequent SHEs would be prepared for each stage of the Proposed development.

The Proposal would be managed through the development and implementation of an operational conservation management plan (OCMP) that would detail the roles and responsibilities for ongoing management of the Proposal Area. This OCMP would review the existing CMP and build upon its conservation policies and guidance.



Legend

Proposal Area

This plan demonstrates the previous masterplan, which has since been updated.
This plan will be revised as required prior to construction.

FIGURE 17.2

Draft Cut and Fill Plan

17.5 Proposed Mitigation Measures

17.5.1 Design

Design considerations and mitigation measures have been incorporated into the Masterplan to reduce or avoid impacts to the heritage values. The design of the Proposal was developed using the following design principles to ensure that the heritage of the Proposal Area remained legible and central to the human experience of the new development. These principles were developed with the intention of embedding the relevant sections of the CMP and Heritage Register listings in the overall design approach (Lovell Chen, 2022, see Appendix F36 in **Appendix F**) and are summarised in Table 17.5 below.

Table 17.5 Design Principles (Lovell Chen, 2022)

Principle	Description
Holistic planning	Heritage is integrated within the overall vision for the site and the development outcome is coordinated across the complex. New uses of the site and its components are sustainable economically and socially, supporting long-term conservation of heritage values. All significant elements are retained and conserved and the heritage significance of the site as a whole is respected and celebrated.
Sustainable adaptation	All significant buildings and elements on the site will be retained, stabilised and conserved. Significant buildings will be repurposed, considering the site as a whole and balancing fabric conservation with the changes required to deliver a sustainable and viable new use.
Spatial planning	The design and arrangement of the new development responds to the spatial qualities of the site. The design approach avoids fragmentation of the site by maintaining key views, relationships, circulation patterns and spaces. In particular, the historical approach from the south, the connections between kiln structures and their chimneys/fan houses, and the north-south connection to the Brickyard will be maintained, and the heritage structures will remain the dominant visual elements in these areas.
Conservation	A full program of conservation and remediation works will be integrated into the development, informed by expert advice and investigations.
New built form	New built form will be introduced that supports sustainable and viable new uses of the site and its elements. New buildings and elements (such as elevated walkways) will be located and designed to maintain key visual and spatial relationships and points of appreciation of significant structures. New structures will be recessive in height and scale, and adopt a complementary form, character, detailing and material palette.
Landscape	The landscape treatment will enhance and interpret the distinctive qualities of the heritage core, the quarry and geological features and railway remnants. As set out in the Yarralumla Brickworks Precinct Interpretation Strategy (Lovell Chen, February 2022) interpretive elements will be integrated with landscaping and wayfinding.
Plant and equipment	Plant and equipment will be maintained consistent with the CMP where it contributes to the significance of the site/or an understanding of the operation of the place as a Brickworks. Some fragmentary industrial equipment may be retained where possible for its contribution to an industrial aesthetic.

Principle	Description
Archaeology	The design has been informed by archaeological assessments conducted by Navin Officer (2016) and investigations and assessments conducted by GML (2020). Consistent with the recommendations in the GML report, archaeological findings will be interpreted through interpretation/landscape treatment, subsurface flues will be stabilised, works will be monitored in selected un-investigated areas, and works in other areas will follow an unanticipated finds protocol.

The following statements demonstrate the commitments the Proponent would make for the Proposal, which would ultimately achieve a high-quality design and positive heritage outcome for the Proposal Area.

- The proposed design would demonstrate compliance with the site's endorsed CMP (GML, 2021a). The Proponent commits to implementing the Conservation Policy in accordance with the Implementation Schedule outlined in Section 6.4 of the CMP.
- Design the Proposal so that the Significant Features of the quarry identified in the Yarralumla Brickworks heritage listing remain intact and can act as a monument displaying the Yarralumla Formation.
- The Proposal would incorporate the recommendations and management guidelines of the Conservation Management Plan into the design of the CBP buildings.
- The Proposal would retain all core and supporting elements and spaces.
- The proposed design has been and will continue to be prepared in accordance with the Burra Charter principles and the International Committee for the Conservation of Industrial Heritage (TICCIH) Charter for Industrial Heritage, with a focus on the in-situ retention of as much original building fabric as possible, and appropriate adaptive reuse.
- Heritage advice would continue to be sought throughout the development process to ensure the heritage values are conserved and interpreted
- An archival recording would be undertaken prior to the commencement of any works on site, in accordance with the AER (GML, 2022a), which would provide an accurate representation of the heritage elements in their current state and would assist with future interpretation opportunities.
- The proposed works would be undertaken in accordance with an approved AA and AER.
- The geological heritage formations would be preserved and access to the four sites would be restricted. The area around site C would also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).
- Development of an Interpretation Strategy (GML, 2022a) that would outline a range of on-site heritage interpretation methods to be developed in consultation with ACT Heritage Council, a heritage advisor and in close reference to the CMP and associated documentation. These would include elements such as signage along with integrated landscape elements and allowing the heritage buildings to speak for themselves through retained and exposed fabric and features.

- In accordance with Policy 10.2 of the CMP, repair work would be undertaken to the subsurface flues (particularly the Downdraught Kilns flues) to ensure that they are made safe prior to any actions associated with the redevelopment works commencing. These works would be developed in consultation with an appropriate engineer and assessed for their impact to the heritage significance of the flues through a SHE.
- The Proponent is committed to working with and seeking approval from ACT Heritage Council to determine the most appropriate means of interpreting and potentially adaptively reusing BRW8.

The Proponent has also engaged specialist heritage architects to work on the Heritage Core to ensure compliance with the approved CMP. Specific conservation measures would be developed once detailed design and a detailed construction program is finalised.

17.5.1.1 Unanticipated Finds Protocol

The Unanticipated Finds Protocol is contained in Appendix E of the CMP (GML, 2021a) which is reproduced in Appendix F38 in **Appendix F** of this report. The Unanticipated Finds Protocol would be updated and incorporated into the CEMP prior to commencement of construction works.

17.5.2 Construction

17.5.2.1 Geotechnical Investigations

The proposed geotechnical investigation works to be undertaken prior to construction would generally have no heritage impact on the significance of the CBP; however, there are identified impacts to potentially significant archaeological remains which would be proactively managed in accordance with the mitigation measures outlined below.

- The location of the flues and subsurface workings in the vicinity of the kiln structures would be surveyed to ensure investigations can be located to avoid any impacts
- Regarding BRW 12, locations of proposed boreholes would be cross checked with the surveyed location of the flues and subsurface features to avoid any potential impacts in BRW12.
- For works within BRW3:
    - An archaeologist would be on site to supervise the locating of the boreholes and to ground truth the location of archaeological features to avoid impacts to surface features and any potentially significant archaeological remains
    - Excavations would be supervised by an archaeologist, to record soil profiles and any archaeological remains identified during the works
    - Test pits would be excavated with a 300 mm wide flat bucket
    - Test pits would be excavated under the supervision of an archaeologist, in controlled increments, to allow for inspection and recording of any archaeological features.
- For works within BRW7:
    - An archaeologist would be on site to supervise the locating of the boreholes within the base of the pit, where works have potential to impact significant archaeological features, and ground truth the location of archaeological features to avoid impacts to any potentially significant archaeological remains.

17.5.2.2 General Construction

An HMP would be prepared and incorporated as part of the CEMP. The HMP will clearly identify and demarcate environmental and heritage sensitive items/places. Key measures that would be implemented include:

- Ensure all personnel have training/toolbox talk prior to commencing work to inform them of potential impacts to environmental and heritage sensitive items/places on site. In particular, all site contractors involved in the earthworks stage of the redevelopment should participate in a heritage induction. This induction should include information on the history, heritage values, and significance of the Precinct, the areas of archaeological potential, and the Unexpected Finds Protocol. This induction should be prepared and delivered by a heritage specialist.
- Ensure all personnel are aware and acknowledge the locations of environmental and heritage sensitive items/places on site prior to work commencing.
- Where works on heritage items are not proposed, high visibility protective fencing would be installed around heritage structures within proximity to any nearby construction works under the guidance of an appropriately qualified heritage consultant.
- Archaeological monitoring of BRW2, 4, 5, 6, 8 and 9 in accordance with the AER (GML, 2022a).
- Vibration monitoring would be undertaken for heritage elements in close proximity to specific works which are not to be removed as part of the Proposal (refer to **Section 13.0**).
- Maintain safe working distances between retained elements and machinery.
- Where accidental, unapproved damage to heritage items takes place, works would be stopped, and ACT Heritage Council consulted to determine the best course of action for restoring the heritage item.
- The area around site C would be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).
- If unidentified archaeological material—including structural remains and artefact deposits—is discovered during construction, the Unanticipated Finds Protocol would be implemented. The Unanticipated Finds Protocol is to include training of personnel in anticipated discovery procedures.

17.5.3 Operation

The ongoing conservation of the Proposal Area would be detailed within an OCMP, to be incorporated as part of the site's OEMP, and will be prepared in accordance with Heritage Act approvals and advice, including the current CMP (GML, 2021a). This would designate roles and responsibilities for ongoing management of the Proposal Area and provide a monitoring framework. Through the monitoring framework, the integrity of the heritage significance of the CBP can be assessed on a regular basis and conservation management measures implemented to ensure its ongoing preservation.

A plan of management is also to be prepared to ensure the ongoing preservation of the quarry and interpretation of the Yarralumla Formation. Exclusion zones are to be established as outlined in **Section 17.5.1** above.

The application of these management measures against the risks identified in **Section 17.1** and their associated residual risks are outlined below in **Section 17.6**.

17.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
H1	Demonstrate compliance with the site's endorsed CMP (GML, 2021a). The Proponent commits to implementing the Conservation Policy in accordance with the Implementation Schedule outlined in Section 6.4 of the CMP. Retain all core and supporting elements and spaces. Implement conservation works to be carried out with regard for the principles of the Australia ICOMOS Burra Charter 1999. Heritage advice would continue to be sought throughout the development process to ensure the heritage values are conserved and interpreted. An archival recording would be undertaken prior to the commencement of any works on site, which would provide an accurate representation of the heritage elements in their current state and would assist with future interpretation opportunities. The proposed works would be undertaken in accordance with an approved AA and AER. The Proponent would work with the ACT Heritage Council to determine the most appropriate way to interpret and potentially adaptively reuse the materials found at BRW8.	2-unlikely	4-major	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
H2	Incorporate the recommendations and management guidelines of the CMP into the design of the CBP buildings. Development of an Interpretation Strategy (GML, 2022a) that would outline a range of on-site heritage interpretation methods to be developed in consultation with ACT Heritage Council, a heritage advisor and in close reference to the CMP and associated documentation. These would include elements such as signage along with integrated landscape elements and allowing the heritage buildings to speak for themselves through retained and exposed fabric and features.	2-unlikely	4-major	M	Yes
Construction					
H3	Develop and implement industry best practice CEMP including a heritage management plan, which clearly identifies and demarcates environmental and heritage sensitive items/places. Ensure all personnel have training/toolbox talk prior to commencing work to inform them of potential impacts to environmental and heritage sensitive items/places on site. In particular, all site contractors involved in the earthworks stage of the redevelopment should participate in a heritage induction. This induction should include information on the history, heritage values, and significance of the Precinct, the areas of archaeological potential, and the Unexpected Finds Protocol. This induction should be prepared and delivered by a heritage specialist. Ensure all personnel are aware of and acknowledge the locations of environmental and heritage sensitive items/places on site prior to work commencing. Where works on heritage items are not proposed, high visibility protective fencing would be installed around heritage structures within proximity to any nearby construction works under the guidance of an appropriately qualified heritage consultant.	2-unlikely	4-major	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
	Vibration monitoring would be undertaken for heritage elements in close proximity to specific works which are not to be removed as part of the Proposal (refer to **Section 13.0**). Maintain safe working distances between retained elements and machinery. Where accidental, unapproved damage to heritage items takes place, work would be stopped, and ACT Heritage Council consulted to determine the best course of action for restoring the heritage item.				
H4	Develop and implement an Unanticipated Finds Protocol during clearing and construction activities, including training personnel in unanticipated discovery procedures. In accordance with Policy 10.2 of the CMP, repair work would be undertaken to the subsurface flues (particularly the Downdraught Kilns flues) to ensure that they are made safe prior to any actions associated with the redevelopment works commencing. These works would be developed in consultation with an appropriate engineer and assessed for their impact to the heritage significance of the flues through a SHE. Implement specific measures for BRW12, BRW3 and BRW7 as outlined in Section **17.5.2.1** of this EIS. Archaeological monitoring of BRW2, 4, 5, 6, 8 and 9 in accordance with the AER (GML, 2022a).	1-remote	4-major	W	Yes
H5	Develop and implement industry best practice CEMP including a heritage management plan which clearly identifies and demarcates environmental and heritage sensitive items/places. Ensure all personnel have training/toolbox talk prior to commencing work to inform them of potential impacts to environmental and heritage sensitive items/places on site. Ensure all personnel are aware of and acknowledge the locations of environmental and heritage sensitive items/places on site prior to work commencing.	2-unlikely	3-moderate	W	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
	Where works on heritage items are not proposed, high visibility protective fencing would be installed around heritage structures within proximity to any nearby construction works under the guidance of an appropriately qualified heritage consultant. Vibration monitoring would be undertaken for heritage elements in close proximity to specific works which are not to be removed as part of the Proposal (refer to **Section 13.0**). Maintain safe working distances between retained elements and machinery. Where accidental, unapproved damage to heritage items takes place, work would be stopped, and ACT Heritage Council consulted to determine the best course of action for restoring the heritage item. The area around site C would also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).				
H6	Design the Proposal so that the Significant Features of the quarry identified in the Yarralumla Brickworks heritage listing remain intact and can act as a monument displaying the Yarralumla Formation. The area around site C would also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding would also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a).	2-unlikely	3-moderate	W	Yes
Operation					
H7	Develop and implement a detailed operational CMP, including ongoing maintenance of heritage items throughout operation of the site.	2-unlikely	4-major	M	Yes
H8	Develop and implement a detailed operational CMP, including ongoing maintenance of heritage items throughout operation of the site.	1-remote	3-moderate	L	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
	Develop and implement an industry best practice OCMP that incorporates relevant ACT Heritage approvals and advice and provides contact details for ACT Heritage Council in the event any damage occurs to heritage items during operation.				

Through the refinement of the Proposal's detailed design and implementation of the discussed management measures, it is considered that positive conservation outcomes can be achieved for the CBP. The Proposal seeks to implement heritage best practices, and so it is considered that the heritage-related risks associated with the Proposal would be reduced to as low as is reasonably practicable. It is acknowledged that some medium residual risks remain, particularly relating to the design of the Proposal. However, these risks are anticipated to reduce as the Proposal's design is refined and the assessment process progresses. Residual risks are discussed further in **Section 20.0** of this EIS.

18.0 Contamination

Section Summary
This Section provides a discussion of the contamination investigations that have been undertaken within the Proposal Area and their findings. Potential impacts based on these findings are also assessed, in particular relating to Areas of Environmental Concern (AEC) and existing contamination within the CBP.

18.1 Preliminary Risk Assessment

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
Design					
C1	Additional remediation requirements are required beyond those already identified, resulting in delays to the Proposal through the need for further investigation.	3-possible	2-minor	W	No
Construction					
C2	Discovery of previously unidentified contaminated soil during construction results in additional remediation action and potential risks to on-site personnel.	2-unlikely	4-major	M	No
C3	Fuel or chemical spills or inappropriate material storage contaminates soil, groundwater and/or local waterways, which could result in environmental degradation and fines under EP Act.	3-possible	4-major	H	No
C4	Contaminants within stockpiles of soil and waste are dispersed into surrounding areas.	2-unlikely	4-major	M	No
C5	Disturbance to identified AECs expose potentially hazardous materials.	3-possible	4-major	H	No
Operation					
C6	Potential ongoing risks to residents and passive users of the Proposal Area as a result of exposure to contaminants (particularly lead and asbestos).	1-remote	5-catastrophic	M	No
C7	Remediation works fail to adequately remove contaminants from the soil resulting in ongoing health risks to the community and the environment.	1-remote	5-catastrophic	M	No

No.	Risk Scenario	Preliminary Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is the risk ALARP?
C8	Potential for currently unknown contaminants to impact upon the health of residents and visitors to the precinct.	1-remote	5-catastrophic	M	No

18.2 Existing Conditions and Values

The Proposal Area has been subject to extensive contamination investigation and assessment, as summarised in **Section 18.3** below.

Of note, the CBP was the subject of a Detailed Environmental and Geotechnical Site Investigation (DEGSI) undertaken by SMEC in 2016 (refer to Appendix F21 in **Appendix F**). The DEGSI outlined the assessment of AECs within the Proposal Area in accordance with the relevant guidelines endorsed in the Contaminated Sites Environment Protection Policy (CSEPP) (ACT EPA, 2017). The locations of the AECs are shown in **Figure 18.1**.

The findings of the DEGSI (SMEC, 2016a; Appendix F21 in **Appendix F**) can be summarised as follows:

- **Fill** – across the CBP fill depth and composition were observed to be variable and were dependent on location (i.e. thicker fill was present in the former quarry). The dominant feature of the fill was discarded brick waste incorporating reworked natural soils (clays and siltstone/shale cobbles). To a lesser extent, minor quantities of anthropogenic materials were observed in the fill including concrete pieces, glass, bitumen and ash. Concentrations of contaminants were typically low in the fill and met the adopted land use criteria for low density residential uses. In the absence of widespread contamination, the fill could be reused within the Proposal Area, as required, provided its geotechnical quality was considered.

- **Natural Soils** – there was no evidence of contamination in natural soils (clay and bedrock) reported in the Proposal Area.

- **AECs** – 11 AECs have been identified within the Proposal Area. The AECs were assessed to the extent defined in the DEGSI and further assessment was recommended and is described in the Data Review and Gap Analysis and Sampling, Analysis and Quality Plan (SAQP), Yarralumla Brickworks (Arcadis, 2017; Appendix F42 in **Appendix F**). The additional assessment in the SAQP was undertaken to inform the management and/or remediation of soils during construction, including categorisation in accordance with ACT EPA (2019a) Information Sheet 4 for offsite reuse and/or disposal. The SAQP is subject to review and endorsement by the Site Auditor.

- **Groundwater** – the DEGSI did not identify the presence of organic groundwater contamination exceeding the adopted assessment criteria at the sample locations assessed. Elevated metals (cadmium, nickel and zinc) concentrations were reported at some groundwater monitoring locations and were hypothesised to be of natural origin but may also include an anthropogenic component. Further monitoring of groundwater is proposed in the SAQP. However, given the overall absence of contamination in soils at the site, the movement (and/or removal) of soils during the proposed redevelopment is not expected to contribute to groundwater contamination.

A Supplementary Environmental Site Assessment (Agon, 2021a) (Appendix F51 in **Appendix F**) (SESA) was subsequently prepared which identified contaminant-source-pathway-receptor linkages for AECs in a revised Conceptual Site Model (CSM). The SESA compiled and presented all the contemporary and historical environmental assessment data with respect to the proposed development Precincts. The intent of the SESA was to determine which Precincts are suitable, from a contamination perspective, for the proposed redevelopment and if any management and/or remediation strategies are required to render any Precinct suitable for its intended uses.

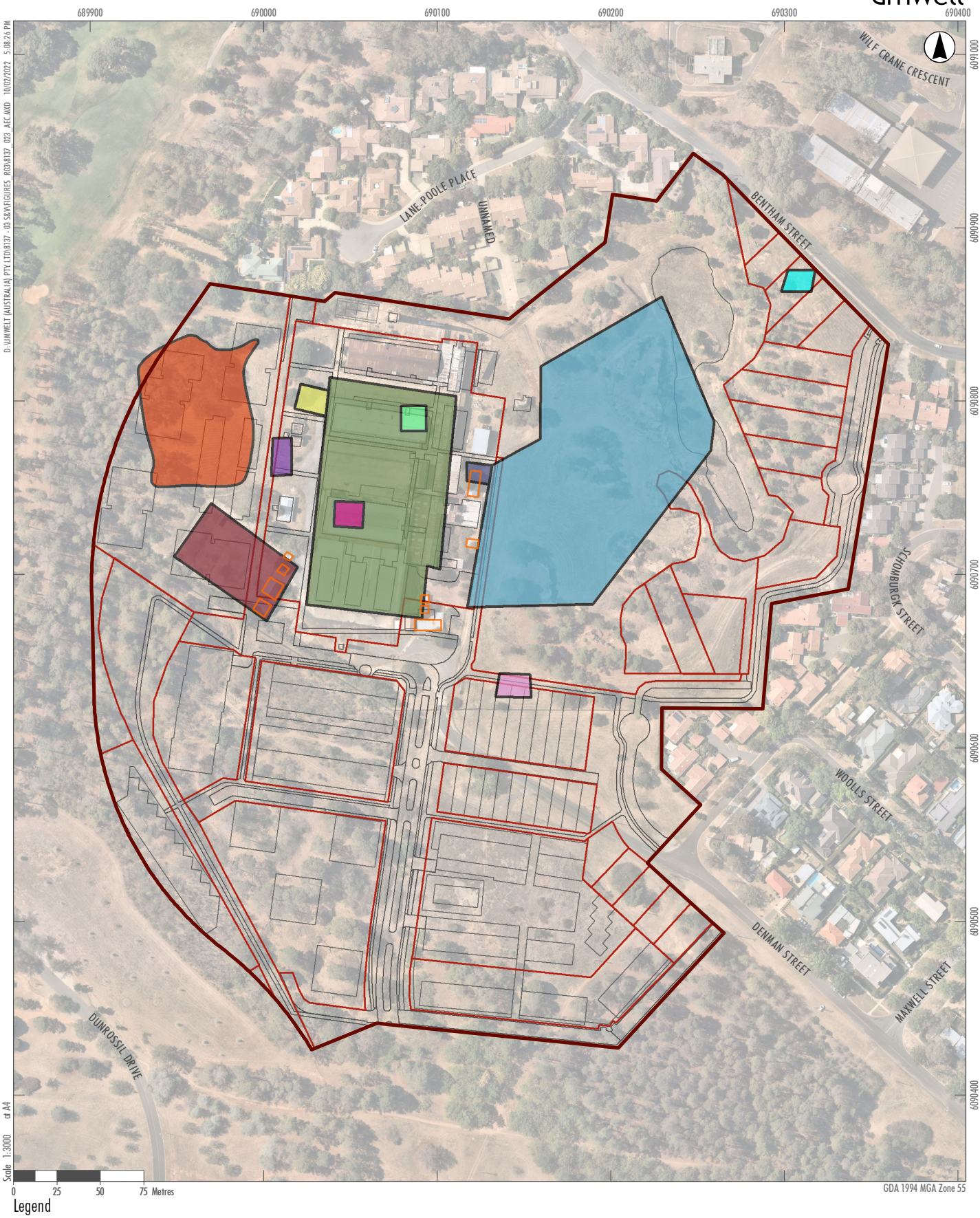
A total of 11 AECs were identified as being present at the site and these are summarised in **Table 18.1** below.

Table 18.1 Areas of Environmental Concern

AEC	Contaminants of Concern (CoC)		Description
AEC#01 Kilns	Metals PAHs TRH	BTEX Dioxins	Sands, dust, surface areas located within the Kilns. This media reported elevated concentrations of lead and zinc in excess of the adopted ASC (2013 NEPM HIL D criteria).
AEC#02 Surface Soils Kiln 1 Fan House	Metals		Surface soils west of the fan house for Kiln 1 reported elevated concentrations of zinc and lead.
AEC#03 Quarry Fill	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	Soil sampling within the infilled quarry has not identified the presence of any gross chemical contamination. However, there is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.
AEC#04 Groundwater Quarry Area	Metals TRH BTEX	PAHs PCBs	Defined as the groundwater directly below the former Quarry which has been extensively infilled. Insufficient historical assessment has been performed at this AEC.
AEC#05 Brickworks Soils	Metals TRH BTEX	PAHs PCBs	Defined as general soils around and below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#06 Groundwater Brickworks Area	Metals TRH BTEX	PAHs PCBs	Defined as the groundwater directly below the brickworks (i.e., the Heritage Core area). Insufficient historical assessment has been performed at this AEC.
AEC#07 UST	Metals TRH	BTEX PAHs	A former Underground Storage Tank (UST) was identified. Insufficient historical assessment has been performed at this AEC.
AEC#08 Asbestos Dump	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	A mound of soil, anecdotally identified as containing asbestos building material debris, is present in the northern portion of Precinct 1 and was subject to remedial works which removed majority of the asbestos materials. Further assessment of the mound and any residual asbestos impacts is required.

AEC	Contaminants of Concern (CoC)		Description
AEC#09 Fill Whole Site	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	Extensive fill material has been identified across the site. There is uncertainty in the exact nature, extent and composition of filling activities. Further assessment was recommended to reduce this uncertainty.
AEC#10 Residential Precincts	Metals TRH BTEX PAHs	OCP/ OPP PCBs Asbestos.	The location of the development areas was not known at the time of SMEC (2016). Accordingly additional targeted locations were proposed.
AEC#11 Benzene in Groundwater	BTEX		SMEC (2016) detected benzene (albeit at low concentrations) in groundwater at monitoring wells M2 and M7. Temporal and spatial variation of benzene concentrations within groundwater at the site have not been fully assessed.

AECs are mapped in **Figure 18.1** below.



Legend

- Proposal Area
- Structures to be Demolished

Areas of Environmental Concern

- AEC 1
- AEC 2
- AEC 3
- AEC 4
- AEC 5
- AEC 6
- AEC 7
- AEC 8
- AEC 9
- AEC 10
- Approximate Area of Asbestos dump

FIGURE 18.1

Areas of Environmental Concern

Image Source: Nearmap (Jan 2020) Data source: Geoscience Australia; www.ACTmapi.act.gov.au ©Australian Capital Territory; Doma (2020)

18.3 Investigations

The following investigations have been undertaken for the Proposal:

- Preliminary (Environmental) Site Investigation. Canberra Brickworks (SMEC, 2014) (refer to Appendix F40 in **Appendix F**).
- Stage 1 Environmental Site Assessment, Canberra Brickworks Remediation Project Block 1 Section 102 Yarralumla, Canberra Centra ACT (Robson Environmental, 2015) (refer to Appendix F23 **Appendix F**).
- Canberra Brickworks: Detailed Environmental and Geotechnical Site Investigation (SMEC, 2016a) (Appendix F21 in **Appendix F**) prepared for the LDA.
- Contamination Summary Letter (Agon Environmental, 2020) addressed to BLOC (refer to Appendix F43 in **Appendix F**).
- Data Review and Gap Analysis and Sampling Analysis and Quality Plan, Yarralumla Brickworks (Arcadis, 2017) (refer to Appendix F42 in **Appendix F**).
- Supplementary Environmental Site Assessment: Canberra Brickworks Yarralumla ACT (Agon Environmental, 2021a) prepared for Doma Group (refer to Appendix F51 in **Appendix F**).
- Remediation Works Plan: Canberra Brickworks, Yarralumla ACT (Agon Environmental, 2021b) prepared for Doma Group (refer to Appendix F52 in **Appendix F**).
- Development Site Management Plan (DRAFT): Canberra Brickworks Yarralumla ACT (Agon Environmental, 2021c) prepared for Doma Group (refer to Appendix F53 in **Appendix F**).This is an iterative version of the Site Management Plan (SMP) and includes a draft Unexpected Finds Protocol (UFP). This document will be subject to review and endorsement by the EPA Site Auditor and will be revised in accordance with any comments received by the EPA.

18.4 Potential Impacts

Referring to the risk assessment outlined in **Section 4.0** of this EIS and summarised specifically for contamination in **Section 18.1** above, the potential impacts of the proposed redevelopment of the CBP relating to contamination may be characterised as:

- Disturbance to identified AECs leading to exposure of potential contaminants.
- Exposure of residents and passive site users to both known and unknown contaminants, including any toxic substances used during construction, and any unknown contaminants during operation.
- Failure of remediation works resulting in contaminants remaining within soil and/or leaching into groundwater and/or surface water runoff.

These potential impacts are analysed in detail below.

18.4.1 Disturbance to AECs

The DEGSI was subject to review by ACT EPA-accredited Contaminated Land Site Auditor Mr Lange Jorstad of Geosyntec Consultants (reference LBJ 14/02). Interim Audit Advice (IAA#07) provided by the Site Auditor concluded:

> *In summary, the results of investigation to date have only identified a small number of discrete contamination issues, and the widespread presence of fill material does not appear to be associated with widespread chemical or asbestos impact (this comment excludes the asbestos dump area). Uncertainties remain at the site, and unexpected contamination issues may still exist despite a reasonable level of judgemental and systematic investigation, particularly given the inherent variability of fill material. Identified data gaps should be addressed if and when access constraints allow, and it is recommended that any future development should proceed under the guidance of an environmental management plan (EMP) with an unexpected finds protocol.*
>
> *Any supplementary investigations (plans and results) or management plans addressing contamination at the site must be reviewed and endorsed by an accredited contaminated site auditor. Any remediation action plans prepared to address contamination issues at the site must also be submitted to ACT EPA for review and approval, following the auditor's review and endorsement, prior to implementation.*

The numerous investigations that have been undertaken within the Proposal Area indicate that there is no widespread contamination in soils (fill and/or natural) and groundwater.

However, data gaps were identified in the SAQP (Arcadis, 2017; Appendix F42 in **Appendix F**). Accordingly, the SESA (Agon Environmental, 2021a; Appendix F51 in **Appendix F**) was prepared to address the data gaps identified in the SAQP and is subject to review by the ACT EPA approved Site Auditor. Overall, the field investigations undertaken for the SESA were done in compliance with the SAQP (Arcadis, 2017). However, the following additional sample locations were advanced:

- Shallow hydrocarbon odours and stained soils were observed to be present directly below the concrete slab located in the southern portion of the Precinct 1. Sample locations TP253-TP27 and BH110-BH1115 were advanced to determine the nature and extent of these impacts.
- BH108 and BH109 were advanced at the location of the former oil store.

The revised CSM presented in the SESA did not identify any complete contaminant-source-pathway-receptor linkages associated with the AECs, with exception of the following discrete areas. These areas will require further assessment and are the focus of the Remediation Works Plan (RWP) (Agon Environmental, 2021b; Appendix F52 in **Appendix F**). The RWP outlines the screening trial for known areas of asbestos, provides a methodology to remove the UST and provides assessment of 'hotspots' which will allow for targeted small-scale remediation. This plan represents a preliminary Remediation Action Plan (RAP) as requested by the Scoping Document (refer to **Appendix A**) and is subject to review and endorsement by the EPA Site Auditor.

Areas requiring further assessment were identified in the RWP as:

Precinct 1 (Medium Density Residential)

- Asbestos Dump (AEC#08) – The fill mound identified as the Asbestos Dump contains pockets of anthropogenic inclusions which may contain fragments of bonded asbestos. The fill mound is located in Precinct 1 which is proposed to be bulk excavated for the construction of basement carparking. It is recommended a trial be undertaken to determine if mechanical screening could be undertaken to remove asbestos impacts (and other anthropogenic inclusions) to enable the offsite reuse of the soils contained in the mound. Screened soil would be subject to further assessment in accordance with ACT EPA (2019a) Information Sheet 4.
- BH110-1.0–- Concentrations of lead were greater than 2.5 times the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, and further assessment is recommended.

Precinct 2 (Medium Density Residential)

- TP243 – Contains bonded asbestos impacts and concentrations of B(a)P greater than 2.5 times the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants further assessment, remediation and validation.

Individual Housing Block Precinct (Low Density Residential)

- TP223–- Concentrations of lead were greater than 2.5 times the adopted human health assessment criteria. The source of this impact is unclear and could be anomalous, and further assessment is recommended.

Road and Open Space Network

- SS6–- Concentrations of lead were greater than 2.5 times the adopted human health assessment criteria. Accordingly, this sample location is considered to be a hotspot that warrants further assessment, remediation and validation.
- UST (AEC#07) – The UST remains a potential source of hydrocarbon impacts to soil and groundwater and must be decommissioned, removed and validation in accordance with ACT EPA (2016) Information Sheet 1.

Table 4 of the RWP (refer to Appendix F52 in **Appendix F**) details the proposed scope of work for further assessment and/or management of each of these AECs and hotspots. For the AECs and hotspots requiring further assessment, the subsequent data will be reviewed in consultation with the Site Auditor to determine if remediation of any identified contamination is required. Should it be determined that remediation is required, the following nominal remediation and validation specification will be applied, as specified within the RWP:

- The nature, extent and volume of soils requiring remediation will be specified and formalised in a soil classification report prepared in accordance with:
    - ACT EPA (2019a) Information Sheet 4
    - Environment ACT (2021) ACT's Environmental Standards: *Assessment and Classification of Liquid and Non-Liquid Wastes.*
- The soil classification report is to be submitted to the ACT EPA for review and approval as per ACT EPA (2019). No soils are to leave the site without ACT EPA approval.
- Once approved the soils may be excavated and removed from site immediately. If stockpiling of soils is unavoidable, refer to stockpiling specification in Table 5 of the RWP.
- Following removal of soils, the following nominal validation sampling program is to be implemented in accordance with the field methodologies specified in Appendix B of the RWP:
    - Base – One sample per base or per 5 m^2.
    - Walls – One sample per wall or one sample per 5 linear metres.
    - Contaminants of concern and validation assessment criteria for each AEC/Hotspot are presented in Table 4 of the RWP.
- All details of the soil classification, EPA approvals, material tracking and disposal records are to be kept for inclusion in reporting (refer to Section 4.6 of the RWP).

18.4.2 Exposure to Contaminants and Toxic Substances

Exposure to contaminants and toxic substances, both during construction and operation, can result in significant health impacts to surrounding residents, on-site personnel, future residents, and passive users of the Proposal Area. Contaminants within soils can migrate into ground and surface water, leading to contaminated drinking water, or may be inhaled as dust during construction.

There are, however, discrete AECs that require remediation and/or management. However, the SESA (Agon Environmental, 2021a) found that all areas containing AECs were either suitable for the proposed development, or could be made suitable through the implementation of the RWP and SMP. The RWP and SMP must be endorsed by the EPA appointed Site Auditor and their implementation is subject to independent audits. The Site Auditor would ultimately confirm whether or not the site is suitable for occupation.

Toxic substances may also be used during construction, notably fuel, paints, wood treatments and fibreglass. The use of these substances would be managed through a CEMP. This is further discussed in **Section 18.5** below.

18.4.3 Failure of Remediation Works

Remediation works can fail for a number of reasons, including a lack of appreciation for the extent of contamination or adoption of inappropriate remediation methods. As the potential impacts associated with contamination are severe, including direct impacts to human health, degradation of the environment, and impacts to economic viability (e.g., loss of agricultural land); a thorough assessment and compliance process is required.

The Proposal Area has undergone significant ongoing contamination assessment by both the Proponent and the SLA. The extent of potential contamination within the Proposal Area is considered to be well understood, particularly through recent investigation undertaken by the SESA (Argon Environmental, 2021a). In addition, further investigation through the RWP would be carried out.

The finalisation and implementation of the RWP and SMP would also be undertaken in consultation and with the endorsement of the Independent Contaminated Land Auditor and the EPA. Through this process, the appropriate management and remediation measures for the Proposal Area would be determined. This is further discussed in **Section 18.5** below.

18.5 Proposed Mitigation Measures

18.5.1 AECs

The SAQP identified a number of data gaps relating to the assessment of the AECs. The SESA was subsequently carried out in order to fill these data gaps. The findings of the SESA indicate that the AECs do not pose a contamination risk that would preclude the suitability of the site for the proposed development work, with the exception of discrete areas which warrant further assessment and/or remediation.

In the absence of widespread contamination in soils (fill and/or natural) and groundwater, development can occur subject to the implementation of the SAQP, RWP, SMP and UFP (included within the SMP). This approach is consistent with IAA#07. These documents would outline the requirements for further assessment (in discrete areas), management of soils and remediation (where required) throughout development and provide a framework for development to occur from a contamination perspective.

The Proponent commits to implementing the SAQP, RWP, SMP and UFP, including reviewing and revising these documents as instructed by the Site Auditor, to ensure that contaminants are appropriately remediated or encapsulated. The RWP is to remain an iterative document, which means should a more feasible or effective option or additional data become available, the RWP would be revised to provide a more accurate characterisation of site conditions and a more effective remediation approach. Remediation is to be undertaken of identified contaminated sites in accordance with the SAQP, SMP and RWP prior to general construction commencing. The following general specifications outlined in **Table 18.2** would be undertaken in accordance with the RWP.

Table 18.2 General RWP Specifications

Item	Specification
General Health and Safety	Based on the proposed scope of intrusive excavation activities to be undertaken, the Contractor (and nominated Sub-Contractors) will prepare a job specific Safe Work Method Statement (SWMS). If known asbestos impacted soils are to be intercepted by the RWP works then measures outlined under **Asbestos Handling Specification** apply.
Soil Disposal Specification	Any surplus soil needed to be removed from the site generated as part of the RWP must be assessed in accordance with ACT EPA (2019a) Information Sheet 4. No soil is to leave the site without ACT EPA approval.
Imported Soils Specification	Only Virgin Excavated Natural Material (VENM), as defined in ACT EPA (2019b) Information Sheet 10, or commercially available products (subgrade, gravels, road base) are to be imported to site for use as backfill. The imported material must be supported by the following documentation: • In the instance of VENM, a copy of the ACT EPA VENM clearance. • Receipts confirming the source, type and volume of the commercial product imported to site.
Stockpile Specification	If stockpiling of soils is unavoidable the following nominal measures must be implemented (as appropriate to the nature of the works): • Stockpiles must be placed on sealed areas or on plastic sheeting. • Stockpiles must be removed as soon as practicable. • Stockpiles must be wet-down or covered to minimise dust emissions. • Appropriate sedimentation and erosion controls must be put in place. • During excavation activities, the excavation and excavated materials are to be sprayed with water or covered to reduce dust emissions. • At completion of the excavation works, the site surface is to be re-instated to the condition prior to excavation, i.e. sealed areas of the site must be re-sealed, etc.
Asbestos Handling Specification	In the case of soils potentially containing asbestos materials, identified, or encountered unexpectedly, a Worksafe ACT licensed Asbestos Assessor must be engaged to advise on mitigation measures during the handling and/or removal of impacted soils. In addition to the general dust generation mitigation measures the following will also apply: • Oversight of all handling and removal of asbestos impacted soils by a Worksafe ACT licensed Asbestos Removalist. • Provision of air monitoring for asbestos fibres is to be in accordance with the Work Health and Safety (How to Safely Remove Asbestos Code of Practice) Approval 2020 and Guidance Note for Membrane filter method for estimating airborne asbestos dust, 2nd Edition [NOHSC: 3003 (2005)] – the requirement, nature and extent of air monitoring to be advised by the Asbestos Assessor and will be dependent on the nature of asbestos material being handled. • Water spraying will be utilised as required to dampen dust during works in soils that may contain asbestos. The Worksafe ACT licensed Asbestos Removalist and Assessor will provide advice based on daily weather conditions for the management of dust.

Item	Specification
Material Tracking Specification	For the purposes of the RWP, recording the source location and volume of the material removed from site, the waste classification and reuse or disposal approval from EPA, and weighbridge dockets from the landfill (for material disposed at landfill) demonstrating that the amount of material received at landfill is: • Equivalent to the amount of material removed from the site. • Consistent with the amount of material approved for disposal under the EPA approval. • These details are to be retained for reporting (Section 4.6 of the RWP).

18.5.2 General Contamination Management

The adequacy of the management measures proposed within the SAQP, RWP and SMP, and their implementation, would be measured by a compliance review by the Site Auditor. This Site Auditor compliance review would be the basis of the Section A Site Audit Statement (SAS), prepared by the Site Auditor. The Section A SAS is subject to review and endorsement by the ACT EPA prior to occupancy of the site for the proposed land uses.

As such, construction and occupation of the Proposal Area would not be approved by the independent Site Auditor and ACT EPA until it is demonstrated that any contamination on the site has been adequately managed. At this stage, the primary management measure for contamination within the Proposal Area is to design and install an encapsulation cell with a leachate control system that can safely store any contamination that cannot be remediated on-site. This encapsulated cell would be regularly monitored throughout operation, the frequency of which would be determined by the EPA. This would be incorporated into the Proposal's OEMP.

All other contamination would either be treated and stabilised on site or removed to an appropriately licensed disposal facility. This approach would be refined through the implementation of the SAQP, RWP, SMP (and associated UFP).

The preparation and implementation of a CEMP would ensure contamination and toxic substances used during construction would be appropriately managed. Construction management measures to be incorporated into the CEMP would include:

- Implement appropriate health and safety measures when removing or remediating AECs.
- Identify location of site sheds/storage areas for toxic substances and construction vehicle parking in CEMP away from sensitive areas.
- Ensure toxic substances are appropriately stored away with restricted access.
- Develop a spill management protocol to be incorporated into the CEMP prior to construction.
- Ensure stockpiles are tested for contaminants, are appropriately bunded, and positioned away from nearby drainage lines.
- Implement dust suppression measures throughout construction to ensure stockpiles do not spread any contaminated particles, e.g., dampening of stockpiles.

- Asbestos removal is to be carried out by an appropriately qualified person with a Class A Asbestos Removal Licence.
- Develop and implement the UFP within the SMP for all earthworks and construction activities on site.

As stated above, the Proponent will ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. The Proponent will also develop and implement an industry best practice OEMP including EPA contact information for any chance finds during operation. Regular monitoring will be undertaken throughout operation of any containment system kept on site containing contaminated material, the frequency of which will be determined by the EPA.

The application of these management measures against the risks identified in **Section 18.1** and their associated residual risks are outlined below in **Section 18.6**.

18.6 Residual Risk Assessment

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
Design					
C1	Undertake detailed contamination assessments of the Proposal Area (completed). Prepare appropriate management plans, including SAQP, RWP and SMP (completed). Review and revise as instructed by the EPA Site Auditor. Consult and seek endorsement from the EPA Site Auditor.	2-unlikely	2-minor	L	Yes
Construction					
C2	Undertake remediation of identified contaminated sites in accordance with the SAQP, RWP and SMP prior to general construction commencing. Develop and implement the UFP contained within the SMP for all earthworks and construction activities on site.	2-unlikely	3-moderate	W	Yes
C3	Develop and implement industry best practice CEMP that includes the following measures: Identify location of site sheds/storage areas and construction vehicle parking in CEMP away from sensitive areas. Develop a spill management protocol to be incorporated into the CEMP prior to construction. Ensure toxic substance are appropriately stored with restricted access.	2-unlikely	4-major	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
C4	Develop and implement industry best practice CEMP that includes the following measures: Ensure stockpiles are tested for contaminants, are appropriately bunded and positioned away from nearby drainage lines. Implement dust suppression measures throughout construction to ensure stockpiles do not spread any contaminated particles, e.g. dampening of stockpiles. Implement (to be endorsed) RWP and SMP to ensure contaminants are appropriately remediated or encapsulated.	2-unlikely	3-moderate	W	Yes
C5	Undertake detailed contamination assessments to identify AECs (completed). Prepare and implement appropriate management plans, including SAQP, RWP and SMP (completed). Review and revise as instructed by the EPA Site Auditor. Consult and seek endorsement from the EPA Site Auditor. Implement appropriate health and safety measures when removing or remediating AECs. Any surplus soil needed to be removed from the site generated as part of the RWP must be assessed in accordance with ACT EPA (2019a) Information Sheet 4. No soil is to leave the site without ACT EPA approval. Asbestos removal is to be carried out by an appropriately qualified person with a Worksafe ACT licensed Asbestos Assessor. Implement endorsed RWP and SMP to ensure contaminants are appropriately remediated or encapsulated.	2-unlikely	4-major	M	Yes
Operation					
C6	Implement UFP contained within SMP (to be endorsed). Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Develop and implement an industry best practice OEMP including EPA contact information for any chance finds identified during operation.	1-remote	5-catastrophic	M	Yes

No.	Mitigation/Management Measures	Residual Risk Assessment			
		Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
C7	Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Undertake regular monitoring of any containment system kept on site containing contaminated material throughout operation, the frequency of which to be determined by the EPA.	1-remote	5-catastrophic	M	Yes
C8	Implement UFP contained within SMP (to be endorsed). Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Develop and implement an industry best practice OEMP including EPA contact information for any chance finds identified during operation.	1-remote	5-catastrophic	M	Yes

It is acknowledged that some medium residual risks associated with contamination may still remain, even with mitigation measures in place. This is largely attributed to the potentially severe (that is, major and above) consequences of contamination impacts, and to the current data gaps relating to AECs.

However, it is expected that through implementation of the SAQP, RWP and SMP, this residual risk would be further reduced and addressed within an adaptive management framework. The residual risks are considered to be as low as is reasonably practicable. Further discussion of residual risks is provided in **Section 20.0** of this EIS.

19.0 Community and Stakeholder Consultation

Section Summary
This Section details the consultation process undertaken with key stakeholders and the broader local community throughout the development process to date.

19.1 Consultation Objectives

Significant community consultation has been undertaken for the Proposal through the SLA tender process and the Proponent's subsequent community engagement since being nominated as the preferred tenderer. It is noted that the SLA is the current land manager of the Proposal Area, on behalf of the ACT Government (the leaseholder). The Proponent has undertaken monthly progress meetings with the SLA since being awarded preferred tenderer (Doma, 2021) (refer to Appendix F54 in **Appendix F**).

As discussed in **Section 2.8** of this EIS, the Proponent was subsequently selected as the preferred tenderer for the redevelopment of the CBP. Under the CDD executed with the ACT Government, the Proponent is required to conduct extensive community engagement activities throughout the Proposal's design process.

During the pre-tender consultation, a Community Panel was established, which led to the formulation of the Community Objectives to guide the ACT Government's tender evaluation process. The aim of the Community Panel process was to identify and incorporate any issues raised by community members and stakeholders into the proposed redevelopment at the early concept stage and throughout subsequent design stages. This would then ensure that the community's interests were considered throughout the design of the Proposal, through to construction and operation of the CBP.

Other sub-objectives for community and stakeholder engagement for the Proposal included:

- Provide a range of accessible opportunities for stakeholders, interested groups and the wider community to be sufficiently informed about the proposal and provide informed feedback.
- Provide open two-way communication channels, enabling timely resolution of issues raised by the community and stakeholders.
- Facilitate a positive outcome for the Proposal, the community and stakeholders through a constructive working relationship.

It is important to note that while the Community Objectives have been used to guide both the tender process and subsequent design development, not all of these objectives were included in the final CDD. Furthermore, these objectives are not statutory planning or environmental requirements, and are therefore not relevant to the assessment included in this EIS.

Nonetheless, the Proponent has sought to maintain transparency with the Community Panel (and in broader public forums) as to their contractual obligations throughout this assessment process and has sought to assist in resolving issues that are within the purview of the ACT Government.

19.2 Methodology

The CBP has been the subject of public interest for many years, and public consultation has been extensive and continues to occur. The ACT Government has worked closely with the community over many years to refine plans for the redevelopment of the CBP. For example, the outcomes of previous community engagement informed the decision announced in late August 2015 to reduce the redevelopment area and focus on transforming the brickworks into a showcase of sustainable urbanism.

Key community engagement activities that have been undertaken to inform the design development of the Proposal include:

- Public presentations and detailed question and answer sessions to outline design thinking and seek public comment and response to questions.
- Community drop-in sessions held at Deakin and Yarralumla shops to raise awareness of the proposal, respond to questions, and capture community feedback.
- Meetings with relevant authorities, agencies and organisations, including ACT Heritage Council, National Trust, immediate site neighbours (including Government House and Royal Canberra Golf Club), and the Community Panel.
- A public 'memory call' published on the community website (brickworkscommunity.com.au) for hard copy submissions of photographs, written and oral stories and videos.
- Web-based poll to gauge support of revisions to the tender Masterplan.

As described in **Section 2.8**, community engagement has resulted in the following changes to the Masterplan:

- A substantial increase to the number of car parks to be delivered as part of the Proposal.
- Changes to the Masterplan to break up originally proposed apartment buildings into smaller blocks, re-siting them and adding further landscaping.

These measures have significantly reduced the Proposal's impacts on external viewpoints, as well as alleviating community concerns regarding parking and traffic flows.

19.2.1 Stakeholder Consultation

A broad range of groups and individuals have an interest in the redevelopment and reuse of the CBP. In October 2015 community stakeholders were invited by the LDA to participate through a Community Panel forum. Members of the Canberra Brickworks Community Panel represent their groups, organisations or associations which have a non-commercial interest in the redevelopment of the CBP. These include:

- Yarralumla Residents Association.
- Inner South Canberra Community Council.
- National Trust
- See-Change Inner South.

- Geological Society of Australia.
- Canberra Business Chamber.
- Pedal Power.

Other stakeholders involved in the redevelopment of the CBP include:

- ACT Government and utilities (e.g. Actew AGL, Icon Water, Evoenergy)..
- ACT Heritage Council.
- the general community including neighbouring suburban dwellers, potential future residents, and recreational user groups.

As described in the Community Engagement Summary (Doma, 2021; refer to Appendix F54 in **Appendix F**), the bulk of significant community engagement outcomes for the Proposal occurred early in the pre-tender phase. This consultation led to the identification of key issues such as density, ensuring no through traffic from existing road networks into the CBP and provisions for parking.

However, the Proponent has continued to liaise with the Community Panel since being announced as the preferred tenderer in April 2017. The most recent Community Information Session was held on 30 March 2021 and was available either in-person or virtually. The event allowed for the community to ask questions of the Proponent, and for the Proponent to consider any appropriate design changes (if required).

Aboriginal stakeholders identified as Representative Aboriginal Organisations (RAOs) were consulted via email and telephone as part of the Aboriginal Cultural Heritage Assessment (Navin Officer Heritage Consultants Pty Ltd, 2014) in July and August 2014. A representative of one RAO (Buru Ngunnawal) attended the field survey. The Aboriginal Cultural Heritage Assessment concluded that no known Aboriginal heritage sites occur and there are no areas of archaeological potential. The Cultural Heritage Assessment was approved by the ACT Heritage Council on 11 September 2014 (Lovell Chen, 2015).

19.2.2 Consultation with Authorities and Approving Agencies

The National Capital Design Review Panel (NCDRP) is a joint initiative between the ACT Government and the NCA to provide a single city-wide design review panel process before a DA is lodged. Under the supervision of the ACT Government Architect and the NCA's Chief Planner, the NCDRP provides design advice to decision makers, developers and their design teams. While submitting the Proposal to the NCDRP was not a requirement, the Proponent has met with and presented to the ACT Government Architect. The Proponent identified that it has engaged multiple architectural practices to work on the Proposal, including specialist heritage architects to work on the Heritage Core.

In addition, the Proponent has also carried out monthly meetings with the ACT Heritage Council, enabling their feedback to be incorporated throughout design development (Doma, 2021; refer to Appendix F54 in **Appendix F**). The engagement on the design of the Heritage Core with the ACT Heritage Council has occurred in parallel with the consideration of the CMP that was approved in August 2021.

19.2.3 Consultation Tools

A range of tools have been used during the consultation process to reach a broad audience and provide multiple feedback opportunities. Details on the engagement tools utilised by the ACT Government prior to the selection of the Proponent as the preferred tenderer are contained at the links below:

- http://suburbanland.act.gov.au/canberrabrickworks/2010-2011-consultation
- http://suburbanland.act.gov.au/canberrabrickworks/2014-consultation

Since being awarded as successful tenderer, the Proponent has established their own website located at https://www.brickworkscommunity.com.au/ to keep the public up to date on development of the Proposal Area, the developing architecture and designs, and the continuing public consultation process. As noted in the Community Engagement Summary (Doma, 2021; Appendix F54 in **Appendix F**), this dedicated community website has proven to be an effective tool for communicating updates with interested members of the community, as well as providing a conduit for questions to be raised directly with the Proponent.

A Community Engagement Plan (Elton Consulting, 2017; Appendix F16 in **Appendix F**) has been prepared and is continually being refined throughout the design stages. The latest Community Engagement Plan includes the following key elements:

- regular proposal updates to all stakeholders
- broader updates provided through the website and social media
- utilisation of existing marketing channels that were established by the LDA
- alignment of communication with proposal program milestones
- ongoing consultation with the established Community Panel
- utilisation of a range of tools, including one-on-one meetings, monthly meetings with the Community Panel, email updates, website maintenance, public presentations and 'pop-up' information stalls, collection of 'memories', and a quarry party following completion of Stage 1.

The first phase of the engagement milestones has been completed. The next phases would align with Proposal milestones, as detailed in the Community Engagement Plan.

The statutory processes, including the EIS and DA approval process, would also offer opportunities for formal public comment. The relevant government body would provide public notification when required.

19.3 Key Themes Raised

As described in the Community Engagement Summary Report (Doma, 2021) (refer to Appendix F54 in **Appendix F**), a number of key themes of concern have arisen throughout consultation activities. These key concerns have related to:

- Parking and traffic flows.
- Dwelling density, height and viewlines.
- Amenity – particularly concerning the design of new buildings.
- Sustainability.
- Asbestos remediation.
- Landscape and trees.
- Bushfire management.
- Cycling and walking trails.
- Noise and light pollution.
- Commercial activity.
- Utilities.

The Proponent has responded to each of these issues either through amendments to the proposed design of the CBP (as discussed in **Section 2.8.3**), clarification of process, or through clear justification. These responses are detailed within the Community Engagement Summary Report (Doma, 2021) (refer to Appendix F54 in **Appendix F**).

Key design responses that have been made to address community concerns include:

- Provision of additional car parking.
- Reduced density of proposed apartment buildings to the south, creating smaller blocks with further landscaping.
- Inclusion of setbacks, particularly at the interface with Lane-Poole Place and the Proposal.

In addition, the Proponent has amended the proposed road network at the southern end of the CBP to ensure an appropriate IAPZ is included. This design amendment was in response to feedback received from ESA (refer to **Section 14.4**).

It is considered that the Proponent has taken all reasonable actions to ameliorate the concerns of the community and other stakeholders and ensure that an appropriate balance is achieved between varying interests.

19.4 Consideration of Public Representations

The draft EIS was submitted to the EPSDD on 3 June 2021. The draft EIS was then placed on public exhibition from 8 June to 21 July 2021. A number of submissions were made by the community and various government agencies. Responses to these comments have been made throughout this revised EIS, with both submissions and references to responses summarised in **Appendix G**.

20.0 Residual Risks Against Potentially Significant Impacts

Section Summary
This Section identifies and discusses the medium to high residual risks apparent from the Proposal, as identified in the residual risk assessment tables provided in the preceding sections.

20.1 Consideration of Issues for the Proposal

Through the assessments undertaken for this EIS, it is considered that there remain a number of medium residual risks to the Proposal. No high residual risks are likely. The medium residual risks are summarised in **Table 20.1** below.

Table 20.1 Identified Residual Risks

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
T8	Increases in traffic flow on surrounding access roads resulting in the potential for increased motor vehicle collisions and/or pedestrian injuries	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan. The plan is to include an emergency response procedure to be followed in the event of an accident. Traffic Management Plan is to limit vehicle movement to and from the site where possible. Limit truck movements during peak periods and outside of daytime hours. Ensure truck movements are staged to limit the number of heavy vehicles on the surrounding road network at any one time.	1-remote	5-catastrophic	M	Yes
T9	Traffic disruptions to local roads as a result of increased volumes during construction.	Develop and implement industry best practice CEMP which includes a construction Traffic Management Plan.	3-possible	3-moderate	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
		Traffic Management Plan is also to limit vehicle movement to and from the site where possible. Engage with nearby residents regarding any planned traffic disruptions. Notify surrounding properties of machinery road access timing throughout construction.				
T10	Increased public access to the Canberra Brickworks and new potential conflict points results in impacts to adjacent residents, including traffic congestion, vehicle accidents and parking issues.	Promote active travel options to residents to reduce the need for vehicle traffic. Ensure access points, pedestrian paths and roads are maintained and utilised properly to minimise nuisance to surrounding residents. Maintain public parking on site to reduce overflow on-street parking in neighbouring areas.	2-unlikely	4-major	M	Yes
CC12	Future (2030 and 2070) increase in >35^{o}C days causing heat retention in exposed metal contact (handrails, kids playgrounds etc), and exposed railroad tracks.	Tree canopy/planting, maximising canopy coverage where appropriate. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas. Use of alternative materials for playground equipment to be investigated to minimise heat retention.	2-unlikely	4-major	M	Yes
CC13	Current and future (2030 and 2070) bushfires within the proximity of the	100% recycled air in majority of apartments.	3-possible	3-moderate	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
	development may lead to smoke and limited visibility/poor air quality for occupants and visitors.					
CC14	Future (2030 and 2070) bushfires may lead to loss of property or life.	Maintain asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Reduce fuel loading of green spaces.	3-possible	3-moderate	M	Yes
CC15	Current and future (2030 and 2070) increase in extreme wet weather causing flooding and subsequent damage to infrastructure and services, increase in stormwater runoff, and increased severity of hailstorms causing damage to property and personal injury.	No further mitigation measures proposed as flooding impact not considered high risk.	3-possible	3-moderate	M	Yes
CC16	Future (2030 and 2070) increase in extreme wet weather causing excess water ingress leading to loosening of soils and potentially affecting stability of the heritage chimney.	Chimney stacks currently structurally sound but will continue to be monitored as part of ongoing management for structural performance. Structures to be retained will be waterproofed.	3-possible	3-moderate	M	Yes
N3	Construction noise resulting in reduced local amenity, community complaints, and non-compliance with EP Act.	Develop and implement industry best practice CEMP which includes a noise and vibration management plan. Identify sensitive receptors prior to construction commencing.	2-unlikely	4-major	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
		Undertake construction activities during standard construction hours throughout the construction phase. Where out-of-hours construction work is to be undertake, ensure surrounding residents are provided with at least 48 hours' notice prior to commencing out-of-hours work. Maintain plant and equipment in accordance with manufacturers recommendations and best practice throughout construction. Site lighting during construction would be inward facing to prevent anti-social behaviour only.				
R1	Proposed bushfire mitigation measures (e.g. inner asset protection zones) are not adequately managed, both within the CBP and on adjacent land over the life of the Proposal, increasing the bushfire risk to residents.	Apply regulated asset protection zones to the CBP and incorporate during design phase. Collaborate with the adjacent land users (i.e. ACT Government or the Royal Canberra Golf Club) to develop an agreement for the management of IAPZ that fall outside the CBP over the life of the Proposal. Parks within the Proposal are to be maintained to the prescriptions of an IAPZ as defined by the ACT Strategic Bushfire Management Plan (2014). Management is also to comply with the 'Low Threat Vegetation' as	1-remote	5-catastrophic	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
		defined by Section 2.2.3.2 of AS 3959-2009. Prepare a bushfire management plan to manage asset protection zones.				
R2	Loss of life and property resulting from construction fire.	Develop and implement industry best practice CEMP prior to construction works commencing. Implement an approved bushfire hazard management plan during construction. Maintain plant and equipment in accordance with manufacturers' recommendations and best practice. Observe seasonal and daily fire hazard warnings issued by the ACT ESA. Cease all works that could emit a spark (hot works including cutting, welding, grinding, rock excavation etc) under a declared Total Fire Ban. Keep vehicles on formed roads and paths, away from long grass where possible. Provide appropriate parking areas for personnel that are away from long grass and other ignition sources. Apply smoking restrictions throughout the construction site, providing designated smoking areas. Avoid unnecessary idling of vehicles.	1-remote	5-catastrophic	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
R3	Loss of life and property resulting from inadequate response to construction fire.	Include a fire response plan within the CEMP. Ensure all personnel on site are advised of fire response protocols and emergency exit procedures during site inductions. Ensure fire extinguishers are available in all construction site compound buildings.	1-remote	5-catastrophic	M	Yes
R4	Fire hazard management conducted at an inappropriate interval and intensity leading to increased risk to residents	Maintain inner asset protection zones in accordance with the ACT Strategic Bushfire Management Plan. Develop and implement an industry best practice bushfire management plan as part of the OEMP including details as to the frequency and intensity of fire hazard management throughout operation of the site.	1-remote	5-catastrophic	M	Yes
G1	Subsurface conditions that may impact construction activities not identified and inappropriate design concepts developed as a result	Ensure detailed geotechnical investigations of the Proposal Area are undertaken to inform design (completed). Soil compaction would be used to ensure soil stability for the Proposed development, particularly along the quarry cliffs. Site drawings and detail must be provided to Environment Protection Authority, for approval prior to works commencing.	2-unlikely	4-major	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
B8	Spread of invasive species off-site, e.g. Chilean needlegrass, African lovegrass	Develop and implement industry best practice CEMP prior to construction, that includes a weed management plan that addresses potential spreading of existing invasive species (particularly Chilean needlegrass) through construction vehicles, personnel, and vegetation waste. Identify areas of weed infestation for removal, management and avoidance during and after construction. Ensure plant, equipment and clothing are free of soil and vegetative matter prior to being brought to site. Where possible, disturbance of native vegetation would be minimised. Monitor high-risk areas such as access roads, stockpiles, and bare ground. Ensure erosion controls are in place to minimise the spread of weeds from run off. Undertake weed removal activities where appropriate, including prior to and after construction. Do not use weed material as mulch on site unless it has been appropriately composted to remove any potential re-growth.	3-possible	3-moderate	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
H1	The Proposal results in impacts to the heritage values of the Yarralumla Brickworks and Railway Remnants due to the recommendations of the Conservation Management Plan not being appropriately implemented during the design phase	Demonstrate compliance with the site's endorsed CMP (GML, 2021a). The Proponent commits to implementing the Conservation Policy in accordance with the Implementation Schedule outlined in Section 6.4 of the CMP. Retain all core and supporting elements and spaces. Implement conservation works to be carried out with regard for the principles of the Australia ICOMOS Burra Charter 1999. Heritage advice would continue to be sought throughout the development process to ensure the heritage values are conserved and interpreted. An archival recording would be undertaken prior to the commencement of any works on site, which would provide an accurate representation of the heritage elements in their current state and would assist with future interpretation opportunities. The proposed works would be undertaken in accordance with an approved AA and AER. The Proponent would work with and seek approval from the ACT Heritage Council to determine the	2-unlikely	4-major	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
		most appropriate way to interpret and potentially adaptively reuse the materials found at BRW8.				
H2	Material selection and finishes result in additional impacts to the heritage values of the Yarralumla Brickworks as they are not consistent with the Conservation Management Plan	Incorporate the recommendations and management guidelines of the CMP into the design of the CBP buildings. Development of an Interpretation Strategy (GML, 2022a) that would outline a range of on-site heritage interpretation methods to be developed in consultation with ACT Heritage Council, a heritage advisor and in close reference to the CMP and associated documentation. These would include elements such as signage along with integrated landscape elements and allowing the heritage buildings to speak for themselves through retained and exposed fabric and features.	2-unlikely	4-major	M	Yes
H3	Damage to sensitive environmental and heritage items caused by construction vehicles accessing the site	Develop and implement industry best practice CEMP including a heritage management plan, which clearly identifies and demarcates environmental and heritage sensitive items/places. Ensure all personnel have training/toolbox talk prior to commencing work to inform them of potential impacts to environmental and heritage sensitive items/places on site. In particular, all site	2-unlikely	4-major	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
		contractors involved in the earthworks stage of the redevelopment should participate in a heritage induction. This induction should include information on the history, heritage values, and significance of the Precinct, the areas of archaeological potential, and the Unexpected Finds Protocol. This induction should be prepared and delivered by a heritage specialist. Ensure all personnel are aware of and acknowledge the locations of environmental and heritage sensitive items/places on site prior to work commencing. Where works on heritage items are not proposed, high visibility protective fencing would be installed around heritage structures within proximity to any nearby construction works under the guidance of an appropriately qualified heritage consultant. Vibration monitoring would be undertaken for heritage elements in close proximity to specific works which are not to be removed as part of the Proposal (refer to **Section 13.0**). Maintain safe working distances between retained elements and machinery.				

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
		Where accidental, unapproved damage to heritage items takes place, work would be stopped, and ACT Heritage Council consulted to determine the best course of action for restoring the heritage item.				
H7	Use of the Canberra Brickworks results in detrimental effects to the heritage values	Develop and implement a detailed operational CMP, including ongoing maintenance of heritage items throughout operation of the site.	2-unlikely	4-major	M	Yes
C3	Fuel or chemical spills or inappropriate material storage contaminates soil, groundwater, and/or local waterways, which could result in environmental degradation and fines under EP Act	Develop and implement industry best practice CEMP that includes the following measures: • Identify location of site sheds/storage areas and construction vehicle parking in CEMP away from sensitive areas. • Develop a spill management protocol to be incorporated into the CEMP prior to construction. • Ensure toxic substance are appropriately stored with restricted access.	2-unlikely	4-major	M	Yes
C5	Disturbance to identified AECs expose potentially hazardous materials	Undertake detailed contamination assessments to identify AECs (completed). Prepare and implement appropriate management plans, including SAQP, RWP and SMP (completed).	2-unlikely	4-major	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
		Review and revise as instructed by the EPA Site Auditor. Consult and seek endorsement from the EPA Site Auditor. Implement appropriate health and safety measures when removing or remediating AECs. Any surplus soil needed to be removed from the site generated as part of the RWP must be assessed in accordance with ACT EPA (2019a) Information Sheet 4. No soil is to leave the site without ACT EPA approval. Asbestos removal is to be carried out by an appropriately qualified person with a Worksafe ACT licensed Asbestos Assessor. Implement endorsed RWP and SMP to ensure contaminants are appropriately remediated or encapsulated.				
C6	Potential ongoing risks to residents and passive users of the Proposal Area as a result of exposure to contaminants (particularly lead and asbestos)	Implement UFP contained within SMP (to be endorsed). Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Develop and implement an industry best practice OEMP including EPA contact information for any chance finds identified during operation.	1-remote	5-catastrophic	M	Yes

No.	Effects	Mitigation/Management Measures	Residual Risk Assessment			
			Likelihood	Consequence	Risk Rating	Is residual risk ALARP?
C7	Remediation works fail to adequately remove contaminants from the soil resulting in ongoing health risks to community and the environment	Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Undertake regular monitoring of any containment system kept on site containing contaminated material throughout operation, the frequency of which to be determined by the EPA.	1-remote	5-catastrophic	M	Yes
C8	Potential for currently unknown contaminants to impact upon the health of residents and visitors to the precinct	Implement UFP contained within SMP (to be endorsed). Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. Develop and implement an industry best practice OEMP including EPA contact information for any chance finds identified during operation.	1-remote	5-catastrophic	M	Yes

As has been discussed throughout this EIS, the majority of medium risks are the result of the 'Major' to 'Catastrophic' consequences associated with the possible impacts attributed to these risks. That is, they may result in human death, injury, significant economic costs, and possible persistent changes to the environment. However, the likelihood of these consequences occurring is generally considered to be 'Unlikely' or 'Rare', particularly through the implementation of management measures, and therefore the risk is considered to be sufficiently as low as is reasonably possible.

Where this is not the case, this is generally because, despite the implementation of all appropriate management measures, the likelihood of a risk occurring may still be considered 'Possible', with only 'Moderate' consequences. For example, due to the persistent nature of Chilean needle grass, its ability to spread within the CBP following weed management cannot be fully discounted. Similarly, the likelihood of climate change impacts being experienced cannot be fully removed, but the Proponent has sought to reduce the severity of their consequences.

The Proposal has identified a number of management measures that are in addition to industry best practices. Furthermore, through the continued assessment of the Proposal, and the development of the CEMP and OEMP (and their associated management sub-plans), it is expected that these residual risks would be further reduced.

These medium risks have been noted by the Proponent and would be further considered throughout the DA assessment process.

21.0 Recommendations

21.1 Summary of Environmental Management Commitments

The collective measures required to mitigate the impacts associated with the Proposal are detailed in **Table 21.1** below. These measures have been derived from the investigations undertaken for the Proposal and industry best practices and have been included in the Risk Assessment provided in **Section 4.0** of this EIS.

Many of these management measures are completed or interrelated, however, for the purposes of transparency all measures stipulated for each environmental matter within the Risk Assessment have been provided in this summary.

Table 21.1 Summary of Environmental Management Commitments

Management Measures
Construction Impacts A Construction Environmental Management Plan (CEMP) would be prepared by the Proponent prior to the commencement of works. The CEMP would establish site management principles in accordance with industry best practices.
Operational Impacts An Operational Environmental Management Plan (OEMP) would be prepared by the appointed site manager prior to occupation of the Proposal Area. The OEMP would establish ongoing management requirements for the site in accordance with industry best practices.
Land Use and Planning • Ensure detailed design is consistent with all relevant planning legislation, policies and any approvals issued for the Proposal, particularly those under the PD Act and EPBC Act. • Design works so they occur wholly within approved areas, including mitigation measure for indirect impacts and offsite works. • Ensure the entirety of the site is adequately assessed and that impacts outside the CBP are considered. • Seek appropriate approvals for any proposed actions that are inconsistent with the approved design. • Appoint an independent third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits would be reported back to the EPSDD and other agencies as appropriate. • Design the Proposal with consideration for the Canberra Brickworks Conservation Management Plan and the updated Canberra Brickworks Conservation Management Plan (GML, 2021a). • Design the Proposal with extensive consultation with the surrounding Yarralumla community and with consideration for the Yarralumla Neighbourhood Plan. • Undertake environmental impact assessment of the proposed development and incorporate appropriate management measures as part of the Proposal. • Re-evaluate the risk assessment throughout the life of the Proposal (until fully operational) as additional information becomes available to ensure all potential environment impacts are adequately identified and assessed.

Management Measures
Utilities • Consult and collaborate with utility entities and the ACT Government during detailed design and construction to ensure impacts to existing services are adequately managed and that construction staging is considered. • Consider utility installation constraints during detailed design phase to ensure the new infrastructure integrates with existing system. • Mark and/or map the location of utilities at risk of damage and provide to contractors prior to construction commencing. • Use hazard identification tools in accordance with WHS standards to identify potential risks to workers. • Collaborate with utility providers and ACT Government to ensure construction staging minimises impacts to surrounding residential area.
Traffic and Transport • Establishment of no-go zones and fencing prior to construction commencing by implementing an industry best practice CEMP to prevent unauthorised access into adjacent areas. • Inform EPSDD and DAWE immediately if any impacts outside approved area occur. • Ensure the Traffic Management Plan includes heavy vehicle access timing during construction and procedures for identifying and responding to impacts to road surfaces. • Ensure construction teams move trucks carrying excavated material from the Proposal Area to the arterial road network as quickly and efficiently as possible. • Include construction of Brickworks Way in Stage 1 of construction schedule. • Ensure the Traffic Management Plan includes an emergency response procedure to be followed in the event of an accident. • Limit vehicle movement to and from the site where possible via the Traffic Management Plan, in particular limiting truck movements during peak periods and outside of daytime hours. • Staging of truck movements to limit the number of heavy vehicles on the surrounding road network at any one time. • Engage with nearby residents regarding any planned traffic disruptions. • Notify surrounding properties of the timing of machinery road access throughout construction. • Further detailed traffic assessments and management plans would be provided at the DA stage and prior to construction, as required. • The provision of 321 public car parks and 881 private car parks, exceeding the anticipated peak parking demand. • Commit to providing bicycle parking facilities above the quantity required under the BPGC. • Promote active travel options to residents to reduce the need for vehicle traffic. • Ensure access points, pedestrian paths and roads are maintained and utilised properly to minimise nuisance to surrounding residents. • Maintain public parking on site to reduce overflow on-street parking in neighbouring areas. • Include relevant internal roads and intersections in the ACT road maintenance and upgrade program. • Private internal roads are to be incorporated into the OEMP to ensure they receive ongoing maintenance.

Management Measures
Materials and Waste • Develop and implement industry best practice CEMP prior to construction, which includes a waste management plan. The waste management plan is to consider alternative options to landfill where possible, including recycling and reuse of materials. • Conduct construction activities in accordance with EP Act requirements and engage independent auditors to confirm compliance. • Implement training for all personnel in waste sorting and designate responsibilities prior to construction commencing. • Develop and implement an industry best practice OEMP prior to occupation, including ongoing waste management measures. • The OEMP is to aim to facilitate alternative waste management practices within the site, such as recycling and reuse.
Landscape and Visual • Implement Garden City Principles throughout the design process. • Design the Proposal to be sympathetic to the Brickworks Heritage Precinct. • Careful design and siting of buildings, having consideration for topography and surrounding views. • Any substantial design changes that have the potential to result in additional visual impacts would be further assessed in future development applications. • Material selection to be made in accordance with the approved CMP (GML, 2021a). • Material selection would be chosen to minimise reflection or any significant visual impacts. • Design and implement a considered landscape master plan that seeks to enhance amenity of the Proposal Area. • Retain Tree 276 to protect local community amenity and history. • Design the Proposal to maintain the existing terrain as much as possible. • Develop and implement industry best practice CEMP which includes stockpile management strategies. • Locate laydown areas and stockpiles away from sensitive viewers. • Erect fences and other barricades around construction site during the construction phase. • Implement a traffic management plan to minimise timing and frequency of heavy vehicles on local streets as much as practicable. • Develop and implement an industry best practice OEMP prior to occupation, including ongoing landscape management.
Water Quality and Hydrology • Implement the stormwater treatment systems strategy proposed by Alluvium (2022). • Conduct a Safety in Design assessment for all designs to identify risks associated with the construction, operation and maintenance of an asset. This includes risks to works, community and those that would be maintaining the system, as well as risks to the environment. • Design would meet the requirements of the WSUD General Code to ensure post-development flows do not exceed pre-development flows. • All design teams and projects should endeavour to consult with those who would ultimately be maintaining the system, in order to identify required changes to designs so that the assets continue to function appropriately. • Undertake detailed hydrological modelling during the DA stage of the Proposal in order to assess peak flows, peak storage levels and critical durations for sizing detention storage.

Management Measures
• Seek endorsement of the proposed stormwater reuse scheme from TCCS. • Develop and implement industry best practice CEMP that includes and implements management plans to avoid or minimise environmental risks. • Prepare a detailed surface water management strategy prior to construction. • Install a litter trap at the pumping location to increase the Gross Pollutant reduction rate. • Undertake remediation work in accordance with the SAQP, RWP and SMP, in accordance with the requirements of the EPA (refer to **Section 18.5**). • Ongoing management of all stormwater management assets would be incorporated into the OEMP. • WSUD infrastructure would be maintained to standards set out in the WSUD General Code. • Monitor groundwater quality throughout construction and operation of the Proposal by implementing the SAQP, with monitoring to be undertaken at regular intervals (e.g. biannually).
Socio-economic, Health and Recreation • Design the Proposal in accordance with the Yarralumla Plan, Garden City Values and Principles, and the approved CMP (GML, 2021a). • Establish a community panel for ongoing engagement and input into the design of the Proposal (completed). • Ensure community panel is engaged throughout the design and assessment process. • Design the Proposal according to CPTED principles and the Estate Development Code. • Incorporate design features that minimise impacts to surrounding residential properties (see **Section 11.5.2**). • Incorporate parkland into the design of the Proposal (completed). • The CEMP is to include measures to control dust, noise and lighting to minimise impacts on nearby residents. • Refer to mitigation measures for landscape and visual, dust, noise, vibration and lighting in **Section 9.5**, **Section 12.5** and **Section 13.5** respectively. • Operate under the existing Environmental Protection Agreement with the EPA. • Implement an industry best practice OEMP, including measures to manage noise, lighting and landscaping. • Ensure street connections between Dudley Street, Bentham Street and Denman Street are not publicly accessible to prevent the road network from becoming a thoroughfare. • Provide mixed use and commercial spaces that are capable of accommodating social services, such as a medical general practice or childcare facility.

Climate Change and Air Quality
• Design the Proposal using sustainable environmental design principles, including design responses included in **Section 12.5.3** and **Section 12.5.4**.
<u>Dust Emission Suppression</u>
• Implement an industry best practice CEMP including measures such as:
  ○ Dust suppression, including through dampening and/or covering of stockpiles.
  ○ Isolation of excavated areas and transfer points.
  ○ Trucks to be covered when travelling off site or hauling over long distances.
  ○ Minimisation of exposed soil surfaces and regeneration as soon as practical.
<u>Emissions Reduction</u>
• Where possible, orientate units to maximise sun exposure during winter months, while providing sufficient shading during summer months.
• Design buildings that encourage cross ventilation to reduce reliance on mechanical ventilation.

Management Measures

- Limiting the level of direct sun exposure during summer months by utilising window shading structures (overhangs), eaves, or balconies for apartments.
- Use of sustainable natural materials in construction which have low embodied energy and low life cycle impact, such as timber, recycled steel, aluminium and glass.
- The use of brick as a dominant material in building the new terraces, apartments and houses which will increase the thermal value (i.e., absorbing heat during the day and releasing at night), contributing towards energy efficiency.
- High performance facades combined with high levels of insulation to external walls, floors and roofs to enhance thermal mass and minimise impacts of external temperature fluctuations.
- Introduce a rooftop photovoltaic system to the core heritage buildings, to provide the precinct's energy usage and aim for a central heritage precinct that is 'net electricity neutral'.
- Use of low energy and LED lighting.
- Facilitating easy and direct access to public transport and light rail for residents through integrated footpaths and road network.
- Provide EV charging stations and/or conduits throughout the carpark to enable residents to fit EV charging stations in bays to enable EV choice.
- Implement an industry best practice CEMP including measures such as:
    - Where possible, using locally sourced materials to reduce GHG emissions associated with transport
    - Recovery and recycling of construction and demolition waste where possible (once operational, the option to compost vegetation waste would also be provided for residents, where appropriate).
    - Reuse of recycled materials where possible to reduce GHG emissions associated with embodied energy.
    - Incorporation of construction/transport plans within the CEMP to minimise the use of fuel during construction.
    - Assessment of the fuel efficiency of construction plant/equipment prior to selection, and where practical, use of equipment with the highest fuel efficiency and which uses lower GHG intensive fuel (e.g. biodiesel).
    - Regular maintenance of equipment to maintain good operations and fuel efficiency.

<u>Climate Change Resilience</u>

- Wetland water levels monitored during heatwaves and adjusted as required to keep plants alive.
- Replanting program for any plants lost during extreme events.
- Outdoor parking undercover or underground.
- Locate systems appropriately. Providing shelter for equipment will reduce the impact of UV radiation and weather and increased temperature.
- Maintain asset protection zones in accordance with the ACT Strategic Bushfire Management Plan and reduce fuel loading of green spaces.
- Investigate use of alternative materials for playground equipment to minimise heat retention.
- Deeper balconies proposed for western facing apartments, consideration of shading structures for afternoon sun, and appropriate glazing selection to reduce solar heat penetration.
- 100% recycled air in majority of apartments to minimise smoke impacts from nearby bushfires.
- Locate power and communications infrastructure underground to reduce bushfire threat.
- Use of designated access/street for emergency service vehicles.
- Chimney stacks currently structurally sound but will continue to be monitored as part of ongoing management for structural performance.
- Structures to be retained will be waterproofed.

Management Measures
• Assess parking access road levels to assist in stormwater management and minimise water ingress and provide strategies to manage excess water flow to minimise flooding risk to lower carparks. • Specification of durable materials to maximise lifespan of building components. • Implement water management measures outlined in **Section 10.0.** <u>Urban Heat Island Reduction</u> • Tree canopy/planting, maximising canopy coverage where appropriate, and as identified in the Draft Landscape Master Plan. The use of deciduous trees to provide appropriate shading through varied seasons will be considered within the public realms and parkland areas. • Green roofs/green walls to be incorporated during detailed design. • Use of old conveyor as an active water feature, to move water from Pittman Park around the site, contributing to evaporative cooling. • Permeable structures (paving) for additional cooling effects and stormwater management to be incorporated during detailed design. • Shade structures and vegetated pergolas which can be used to combat high solar radiation intensity on hot summer days will be explored in the design phase. • Solar reflective or light coloured paints/coatings and pavements will be used where appropriate, in particular for the open space areas, to increase albedo and solar reflectance. • Use of alternative materials for playground equipment to be investigated to minimise heat retention. • Develop an industry best practice OEMP to ensure trees are regularly maintained to ensure natural shading is provided throughout operation of the Proposal.
Noise, Vibration and Lighting • Design the Proposal with consideration for potential noise and lighting impacts to surrounding properties. • Provide urban parkland between commercial areas and nearby residential areas to buffer potential noise impacts. • Ensure adequate landscaping along property boundaries is included within the design to act as a natural barrier. • Develop NMPs during the DA phase that meets ACT residential and commercial noise requirements. • Develop and implement industry best practice CEMP which includes a noise and vibration management plan. • Develop site-specific vibration criteria for the heritage structures in the Proposal Area. These site-specific vibration criteria would be derived and recommended by a suitably qualified Structural Engineer prior to commencement of construction. • Implement measures contained within AS 2436. • Identify sensitive receptors prior to construction commencing. • Undertake construction activities during standard construction hours throughout the construction phase. • Where out-of-hours construction work is to be undertake, ensure surrounding residents are provided with at least 48 hours' notice prior to commencing out-of-hours work. • Ensure the community is informed of proposed works during consultation so they understand when noisy works would be occurring. • Use modern, well service machinery with appropriate mufflers. • Maintain plant and equipment in accordance with manufacturers recommendations and best practice throughout construction. • Use inward facing site lighting during construction to prevent anti-social behaviour only.

Management Measures
• No lighting is to be installed at the proposed tennis courts and operational lighting impacts to surrounding residents are to be minimised through considered brightness and placement during detailed design.
Hazard and Risk • Apply regulated asset protection zones to the CBP and incorporate during design phase. • Collaborate with the adjacent land users (i.e. ACT Government or the Royal Canberra Golf Club) to develop an agreement for the management of inner asset protection zones that fall outside the CBP over the life of the Proposal. • Parks within the Proposal are to be maintained to the prescriptions of an IAPZ as defined by the ACT Strategic Bushfire Management Plan (2014). Management is also to comply with the 'Low Threat Vegetation' as defined by Section 2.2.3.2 of AS 3959-2009. • Prepare and implement a bushfire management plan to manage asset protection zones, including details as to the frequency and intensity of fire hazard management throughout operation of the site. • Implement an approved bushfire hazard management plan during construction and operation. • Include a fire response plan within the CEMP. • Ensure all personnel on site are advised of fire response protocols and emergency exit procedures during site inductions. • Maintain plant and equipment in accordance with manufacturers' recommendations and best practice. • Observe seasonal and daily fire hazard warnings issued by the ACT ESA. • Cease all works that could emit a spark (hot works including cutting, welding, grinding, rock excavation etc) under a declared Total Fire Ban. • Keep vehicles on formed roads and paths, away from long grass where possible. • Provide appropriate parking areas for personnel that are away from long grass and other ignition sources. • Apply smoking restrictions throughout the construction site, providing designated smoking areas. • Avoid unnecessary idling of vehicles. • Ensure fire extinguishers are available in all construction site compound buildings. • Maintain inner asset protection zones in accordance with the ACT Strategic Bushfire Management Plan.
Soils and Geology • Sediment and erosion control devices are to be installed in accordance with 'Environment Protection Guidelines for Construction and Land Development in the ACT' (Environment Protection Authority March 2011) and fully operational prior to stripping of site topsoil. • A sediment control fence and cut off drain will be installed to the east of the Heritage Core to prevent impacts during construction. The fence will be checked and reinstated (if needed) on a weekly basis. • Stockpile/s to be located away from drainage lines and surface flow paths. Contoured striations or furrows to be provided to stockpiles to minimise erosion. • A stabilised construction entrance is to be established prior to access to site by construction vehicles. Aggregate to be turned when sediment builds up and renewed when required. • Ensure soil is appropriately compacted and stabilised prior to and post construction, particularly along the quarry cliffs. • Revise and review the Environment Management and Protection Plan (EMPP) and associated protocols as required throughout construction. • Protocols for soil compaction will be incorporated into the CEMP to ensure safe procedures. • Where underground stormwater drainage is installed to internal roadworks, provide inlet filter. • Environment Protection Agreement to be taken out by contractor with Environment Protection Authority.

Management Measures
• All new construction work must be contained within the site except for approved service connections and roadworks. • Limit access to site during and immediately after wet weather. • Regularly remove any soil from roads adjacent to the site. • No storage of construction materials, parking of vehicles nor equipment permitted outside of site without TCCS approval. • No site sheds, storage sheds or site amenities to be erected outside of block without TCCS approval. • Provide kerbside filter roll to existing sumps. Kerbside filter rolls to be removed, cleaned and reinstated on a weekly basis at a minimum. Trapped sediment about sumps also to be removed. Cleaning also to take place immediately after periods of rainfall during construction. • All service trenches to be backfilled within 24 hours of inspection. • Excess soil is to be disposed at an Environment Protection Authority approved location. • The site foreman is to contact the Environment Protection Authority to arrange a site inspection and endorsement of sediment and erosion control measures prior to works commencing. • The site foreman is to contact the Environment Protection Authority to discuss any proposed major changes to sediment and erosion controls on site prior to implementing the changes. • Discharge from the pond is permissible when the water pH is 6.5–8.5 and is clarified to or at below 60 mg/L (50NTU). If sediment level is greater, then prior to discharge, the dam must be dosed with either alum or gypsum and allowed to settle until the sediment is less that 60 mg/L (50NTU). • Water level in sediment control ponds to be maintained at less than 20% of capacity to allow runoff storage during a rain event. • Regular dredging of the dam must be carried out to remove silt. • Site drawing and detail must be provided to Environment Protection Authority, for approval prior to works commencing. • The area around site C will be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. • Areas demonstrating anticlinal folding will also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021a). • Additional geotechnical investigations, where required, will also be carried out prior to construction, in order to determine the most appropriate construction methods for the Proposal Area.
Ecology and Natural Environment
• Base the impact assessment on site specific, recent environmental studies (completed). • Use a precautionary approach and risk-based approach to impact assessment for the Proposal (completed). • Survey all trees on site prior to finalisation of design (completed). • Commence consultation with the ACT Government as soon as possible to identify potential offset options (completed). • Engage with DAWE to confirm the appropriate offset approach (completed). • Purchase credits under BOS to offset the proposed impact. • Seek approval under the PD Act and EPBC Act (as required) for the removal of any trees identified within the design process. • Prepare a Flora and Fauna Management Plan as part of the CEMP prior to construction commencing.

Management Measures
• Clear identification of trees that have received approval for removal within final designs. Where additional trees are identified as requiring removal during construction, assessment and approval would be sought where appropriate. • Ensuring landscape species are suitable for urban use and are compatible with surrounding species within Yarralumla. • Establishment of no-go zones, site boundaries, and fences prior to construction commencing to prevent unauthorised access into adjacent areas. • Informing EPSDD immediately if there are any impacts outside approved area. • Conducting pre-clearing surveys to determine clearing boundaries and visibly identify which trees are to be retained (if any). • Confirming the presence of any hollow-bearing trees. Where they are identified, a suitably qualified fauna-handler/ecologist is to remove any hollow-bearing fauna prior to clearing any mature, hollow-bearing trees. • Conducting inspections for roosting bats and possums in building structures to be removed. A suitably qualified fauna-handler/ecologist is to remove any resident fauna within these structures. • Require that contractors appoint a third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP. Results of audits are to be reported back to EPSDD and other agencies as appropriate. • Develop and implement industry best practice CEMP prior to construction, that includes a weed management plan that addresses potential spreading of existing invasive species (particularly Chilean needlegrass) through construction vehicles, personnel, and vegetation waste. • Identify areas of weed infestation for removal, management and avoidance during and after construction. • Ensure plant, equipment and clothing are free of soil and vegetative matter prior to being brought to site. • Where possible, disturbance of native vegetation would be minimised. • Monitor high-risk areas such as access roads, stockpiles, and bare ground. • Ensure erosion controls are in place to minimise the spread of weeds from run off. • Undertake weed removal activities where appropriate, including prior to and after construction. • Do not use weed material as mulch on site unless it has been appropriately composted to remove any potential re-growth. • Develop and implement an industry best practice OEMP, including ongoing weed and pest management and monitoring measure.
Aboriginal and European Heritage
• The Proposal would demonstrate compliance with the site's endorsed CMP (GML, 2021a). The Proponent commits to implementing the Conservation Policy in accordance with the Implementation Schedule outlined in Section 6.4 of the CMP. • Design the Proposal so that the Significant Features of the quarry identified in the Yarralumla Brickworks heritage listing remain intact and can act as a monument displaying the Yarralumla Formation. • The Proposal would incorporate the recommendations and management guidelines of the Conservation Management Plan into the design of the CBP buildings. • The Proposal would retain all core and supporting elements and spaces. • The proposed design has been and will continue to be prepared in accordance with the Burra Charter principles and the International Committee for the Conservation of Industrial Heritage (TICCIH) Charter for Industrial Heritage, with a focus on the in-situ retention of as much original building fabric as possible, and appropriate adaptive reuse.

Management Measures
• Heritage advice and approval would continue to be sought throughout the development process to ensure the heritage values are conserved and interpreted. • An archival recording would be undertaken prior to the commencement of any works on site, which would provide an accurate representation of the heritage elements in their current state and would assist with future interpretation opportunities. • The proposed works would be undertaken in accordance with an approved Archaeological Assessment and Archaeological Excavation Report. • The geological heritage formations would be preserved and access to the four sites would be restricted. The area around 'site C' will also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding will also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd(2021). • Development of an Interpretation Strategy (GML, 2022a) that would outline a range of on-site heritage interpretation methods to be developed in consultation with ACT Heritage Council, a heritage advisor and in close reference to the CMP and associated documentation. These would include elements such as signage along with integrated landscape elements and allowing the heritage buildings to speak for themselves through retained and exposed fabric and features. • In accordance with Policy 10.2 of the CMP, repair work would be undertaken to the subsurface flues (particularly the Downdraught Kilns flues) to ensure that they are made safe prior to any actions associated with the redevelopment works commencing. These works would be developed in consultation with an appropriate engineer and assessed for their impact to the heritage significance of the flues through a SHE. • The Proponent is committed to working with and seeking approval from ACT Heritage Council to determine the most appropriate means of interpreting and potentially adaptively reusing BRW8. • The location of the flues and subsurface workings in the vicinity of the kiln structures would be surveyed to ensure investigations can be located to avoid any impacts. • Implement specific measures for BRW12, BRW3 and BRW7 as outlined in **Section 17.5.2.1** of this EIS. • Develop and implement industry best practice CEMP including a heritage management plan, which clearly identifies and demarcates environmental and heritage sensitive items/places. • Ensure all personnel have training/toolbox talk prior to commencing work to inform them of potential impacts to environmental and heritage sensitive items/places on site. In particular, all site contractors involved in the earthworks stage of the redevelopment should participate in a heritage induction. This induction should include information on the history, heritage values, and significance of the Precinct, the areas of archaeological potential, and the Unexpected Finds Protocol. This induction should be prepared and delivered by a heritage specialist. • Ensure all personnel are aware and acknowledge the locations of environmental and heritage sensitive items/places on site prior to work commencing. • Where works on heritage items are not proposed, high visibility protective fencing would be installed around heritage structures within proximity to any nearby construction works under the guidance of an appropriately qualified heritage consultant. • Archaeological monitoring of BRW2, 4, 5, 6, 8 and 9 in accordance with the AER (GML, 2022a). • Vibration monitoring will be undertaken for heritage elements in close proximity to specific works which are not to be removed as part of the Proposal (refer to **Section 13.0**). • Maintain safe working distances between retained elements and machinery. • Where accidental, unapproved damage to heritage items takes place, stop work, and consult with ACT Heritage Council to determine best course of action for restoring the heritage item.

Management Measures
• The area around 'site C' will also be preserved and protected from development by establishing a five-metre exclusion zone during construction and operation. In addition, areas demonstrating anticlinal folding will also be preserved and protected, as recommended by ACT Geotechnical Engineers Pty Ltd (2021). • If unidentified archaeological material – including structural remains and artefact deposits – is discovered during construction, the Unanticipated Finds Protocol would be implemented. The Unanticipated Finds Protocol is to include training of personnel in anticipated discovery procedures. • Develop and implement a detailed operational Conservation Management Plan, including ongoing maintenance of heritage items throughout operation of the site. • Develop and implement an industry best practice OEMP, which incorporates ACT Heritage Council approvals and advice, including the CMP (GML, 2021a), that provides contact details for ACT Heritage Council in the event any damage occurs to heritage items during operation.
Contamination • Undertake detailed contamination assessments of the Proposal Area to identify AECs (completed). • Prepare appropriate management plans, including SAQP, RWP and SMP (completed). Review and revise as instructed by the EPA Site Auditor. Consult and seek endorsement from the EPA Site Auditor. • Implement (to be endorsed) RWP and SMP to ensure contaminants are appropriately remediated or encapsulated. • Undertake remediation of identified contaminated sites in accordance with the SAQP, SMP and RWP prior to general construction commencing. • Implement appropriate health and safety measures when removing or remediating AECs. • Any surplus soil needed to be removed from the site generated as part of the RWP must be assessed in accordance with ACT EPA (2019) Information Sheet 4. No soil is to leave the site without ACT EPA approval. • Develop and implement industry best practice CEMP that includes the following measures: o Implement appropriate health and safety measures when removing or remediating AECs. o Identify location of site sheds/storage areas and construction vehicle parking in CEMP away from sensitive areas. o Develop a spill management protocol to be incorporated into the CEMP prior to construction. o Ensure toxic substance are appropriate stored away with restricted access. o Ensure stockpiles are tested for contaminants, are appropriately bunded and positioned away from nearby drainage lines. o Implement dust suppression measures throughout construction to ensure stockpiles do not spread any contaminated particles, e.g. dampening of stockpiles. o Asbestos removal is to be carried out by an appropriately qualified person with a Worksafe ACT licensed Asbestos Assessor. o Develop and implement the UFP contained within the SMP for all earthworks and construction activities on site. • Ensure the Proposal Area is audited and approved for occupation by the EPA prior to occupation commencing. • Develop and implement an industry best practice OEMP including EPA contact information for any chance finds identified during operation. • Undertake regular monitoring of any containment system kept on site containing contaminated material throughout operation, the frequency of which to be determined by the EPA.

21.2 Monitoring and Reporting

Monitoring and reporting would be undertaken in accordance with the management commitments outlined above in **Section 21.1**, the detail of which would be further developed through the CEMP.

The following general measures are proposed during construction:

- Develop and implement industry best practice CEMP.
- Require as a condition of consent that contractors appoint an independent third party to conduct audits on environmental approvals and performance against criteria identified in the CEMP.
- Report results of audits back to the ACT planning approval authority and other agencies as appropriate.

Operational monitoring and reporting requirements would be developed through the OEMP.

21.2.1 Indicative CEMP Outline

An industry best practice CEMP would be prepared for the Proposal. The CEMP would detail the required measures to address identified or potential environmental risks and impacts and to manage unexpected finds during the construction phase of the Proposal. It would form the framework for management, accountability, monitoring and reporting on the environmental performance of the Proposal's construction.

The selected contractor would be required to prepare the CEMP, its sub-plans, and protocols, and to have all relevant documentation approved by the EPSDD.

Table 21.2 below provides an indicative outlined of the CEMP.

Table 21.2 Indicative CEMP Outline

Section	Subheadings
Introduction	Project Description and Scope
	Legislative Framework
	Site Work Health and Safety
	The CEMP Process
Site Location and Features	Site Location
	Site Features
Environmental Risk Factors	Summary Table of Environmental Risk Assessment
Roles and Responsibilities	Key Responsibilities • Project Manager • Contractor • Site Users.
Reporting	Work Health and Safety
	Environmental Induction / Training
	Emergency Contacts & Procedures

Section	Subheadings
	Measuring Emergency Response Effectiveness
Monitoring and Review	Monitoring Responsibility – Internal Auditing
	External Audits
	Complaints, Non-conformances, and Corrective Actions
	Review and Control of the CEMP
Appendix A	Induction Register
Appendix B	Complaints Register
Appendix C	Sub Management Plans • Sediment and Erosion Control Plan • Contamination Site Management Plan • Waste Management Plan • Traffic Management Plan • Weed and Pest Management Plan • Flora and Fauna Management Pan • Noise and Vibration Management Plan • Heritage Management Plan • Unexpected Finds Protocol • Air Quality Management Plan • Fire Response Plan • Surface Water Management Plan.
Appendix D	Audit Forms
Appendix E	Demolition / Construction Method

21.2.2 Indicative OEMP Outline

An industry best practice OEMP would be prepared for the Proposal. Similar to the CEMP, the OEMP would form the framework for management, accountability, monitoring and reporting on the environmental performance for the Proposal's ongoing occupation. The OEMP would draw upon data and information provided in areas of ecology, heritage and bushfire management to ensure it incorporates best practice management protocols and monitoring indicators.

The OEMP would include a detailed, revised risk assessment, which would inform the identification of KPI's and ensure management and monitoring measures are fit-for-purpose.

Table 21.3 below provides an indicative outline of the proposed OEMP.

Table 21.3 Indicative OEMP Outline

Section	Subheadings
Introduction	Purpose
	Contextual Overview
	Outline of OEMP
Context	Site Description
	Legislative Context
Risk Assessment	Environmental Risks
	Governance Risks
KPIs	-
Management Sub Plans	Conservation (Heritage) Management Plan
	Landscape Management and Protection Plan
	Weed and Pest Management Plan
	Waste Management Plan
	Noise and Lighting Management Plan
	Contamination Management Plan
	Bushfire Management Plan
	Stormwater Management Plan
	Traffic Management Plan
Responsibilities	Governance of Management Teams
	Roles and Responsibilities
	Funding Mechanisms
Evaluation, Monitoring and Reporting	Adaptive Feedback Process
	Reporting / Compliance
	Dealing with Uncertainty
Duration of Plan and Scheduled Reviews	-

22.0 Conclusion and Justification

This EIS has been prepared to consider the environmental impacts of the proposed redevelopment of the CBP to consist of 380 dwellings (houses, townhouses and apartments), mixed use adaptation of the site's historical core, and urban recreation open space. The EIS has addressed the issues outlined within the Scoping Document (**Appendix A**) and accords with the requirements of the PD Act (ACT) and EPBC Act (Commonwealth).

Having regard to the various environmental considerations associated with the Proposal, including the principles of ecologically sustainable development, the carrying out of the Proposal is justified for the following reasons:

- The Proposal would facilitate the adaptive reuse and interpretation of the existing CBP, which would provide a means of active conservation, to be celebrated and shared with residents of Yarralumla and Canberra more broadly.
- The Proposal would provide a range of housing opportunities, commercial, retail and urban space, that would benefit future residents and the public alike.
- The Proposal seeks to integrate with the existing Garden City character of the surrounding area, and Canberra more broadly, to ensure that the Proposal does not result in any significant adverse impacts on surrounding areas.
- The assessment of the Proposal has demonstrated that the development would not result in any environmental impacts that cannot be appropriately managed or adequately offset in accordance with EPBC Act policy.
- The Proposal is consistent with the principles of ecologically sustainable development and relevant planning controls for the site.

In light of these merits, it is requested that the application be approved.

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