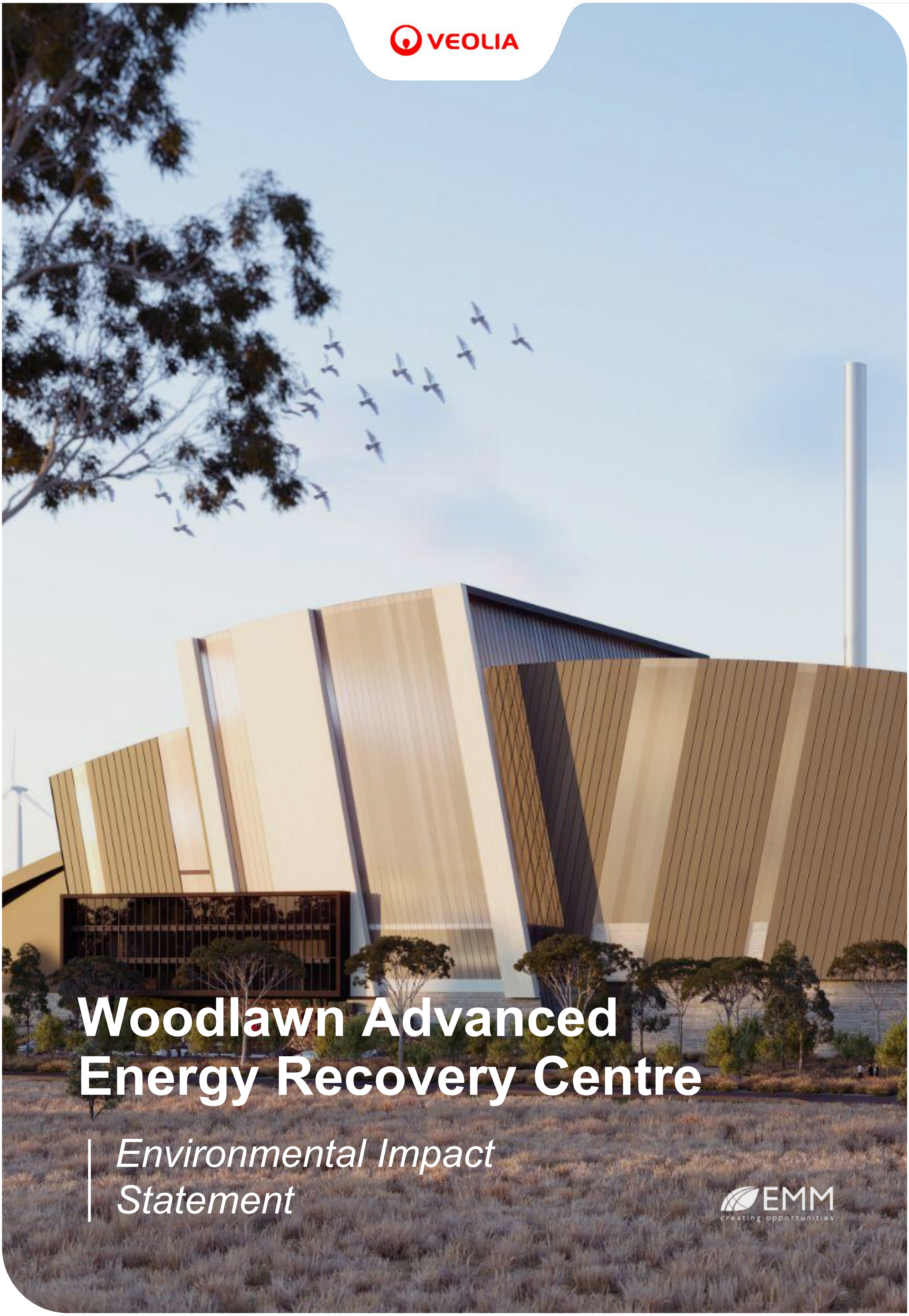

Woodlawn Advanced Energy Recovery Centre

Environmental Impact Statement

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Environmental Impact Statement

Prepared for Veolia Environmental Services (Australia) Pty Ltd

October 2022

Woodlawn Advanced Energy Recovery Centre

Environmental Impact Statement

Veolia Environmental Services (Australia) Pty Ltd

J200931 RP1

October 2022

Version	Date	Prepared by	Approved by	Comments
V2	25 August 2022	Kate Cox	David Snashall	
V3	10 October 2022	Kate Cox	David Snashall	

Approved by

David Snashall
Associate Director
10 October 2022

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Certification

Details of persons by whom this EIS was prepared		
Kate Cox BSc	**Rachel Dodd** BSc (hons), MRes	**David Snashall** BEc, MEnvPln, FPIA

Project details

Project name: Woodlawn Advanced Energy Recovery Centre (ARC) Environmental Impact Statement (EIS)
Application number: SSD-21184278
Address of the land in respect of which the development application is made: 619 Collector Road, Tarago NSW, 2580

Application details

Applicant name: Veolia Environmental Services (Australia) Pty Ltd
Applicant address: Level 4, 65 Pirrama Road, Pyrmont NSW 2009

Declaration

The undersigned declares that this EIS:

- has been prepared in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*;
- contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates;
- does not contain information that is false or misleading;
- addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project;
- identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments;
- has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement;
- contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development;
- contains a consolidated description of the project in a single chapter of the EIS;
- contains an accurate summary of the findings of any community engagement; and
- contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.

Kate Cox	**Rachel Dodd**	**David Snashall**
Associate Environmental Scientist	Associate Environmental Scientist	Associate Director
10 October 2022	10 October 2022	10 October 2022

Acknowledgement of Country

EMM Consulting Pty Ltd acknowledges the First Peoples of Australia as the Traditional custodians of the Ngunawal land upon which this project is proposed. We pay our respects to Elders past, present and future, and to the many Aboriginal and Torres Strait Islander communities across which this project would interact. We recognise, and are grateful for, the long and deep cultural connection that the Ngunawal custodians maintain with their land; and their willingness to share and educate us about this relationship.

Executive Summary

ES1 Introduction

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located on Collector Road, Tarago, NSW. The Eco Precinct is approximately 6 kilometres (km) west of the township of Tarago in the Goulburn Mulwaree local government area (LGA). The regional and local setting is shown in Figure ES1.

The Eco Precinct is a significant waste treatment and disposal complex. It incorporates the Bioreactor (a landfill), a bioenergy power station that operates on landfill gas generated in the Bioreactor, a mechanical and biological waste treatment facility (MBT), a wind farm and a series of other facilities. As the Eco Precinct accepts approximately 40% of Sydney's residual putrescible waste, it is a critical waste management infrastructure for NSW. It is the destination point for an integrated waste management infrastructure system which also includes two transfer terminals in Sydney (Clyde and Banksmeadow) and the Crisps Creek intermodal facility near Tarago.

Veolia's proposed project at the Eco Precinct is to build and operate an Energy Recovery Facility (ERF) named the Woodlawn Advanced Recovery Center (ARC). Of the 1,180,000 tpa (tons per annum) of waste currently approved for transport by rail from Sydney to the Eco Precinct, up to 380,000 tpa will be diverted from the bioreactor to the ARC. This project, however, is not proposing any additional waste transport to the Eco Precinct.

Veolia's Eco Precinct extends over 6,000 ha and the central area of waste management operations comprises 300 ha. Most of the remainder is buffer land used for agricultural purposes. Veolia proposes to develop the ARC within the zone of waste operations. Hence, the nearest privately-owned residence will be more than 4 km away.

This Environmental Impact Statement (EIS) accompanies a State Significant Development (SSD) application under the *Environmental Planning and Assessment Act 1979* (EP&A Act) for Veolia's project.

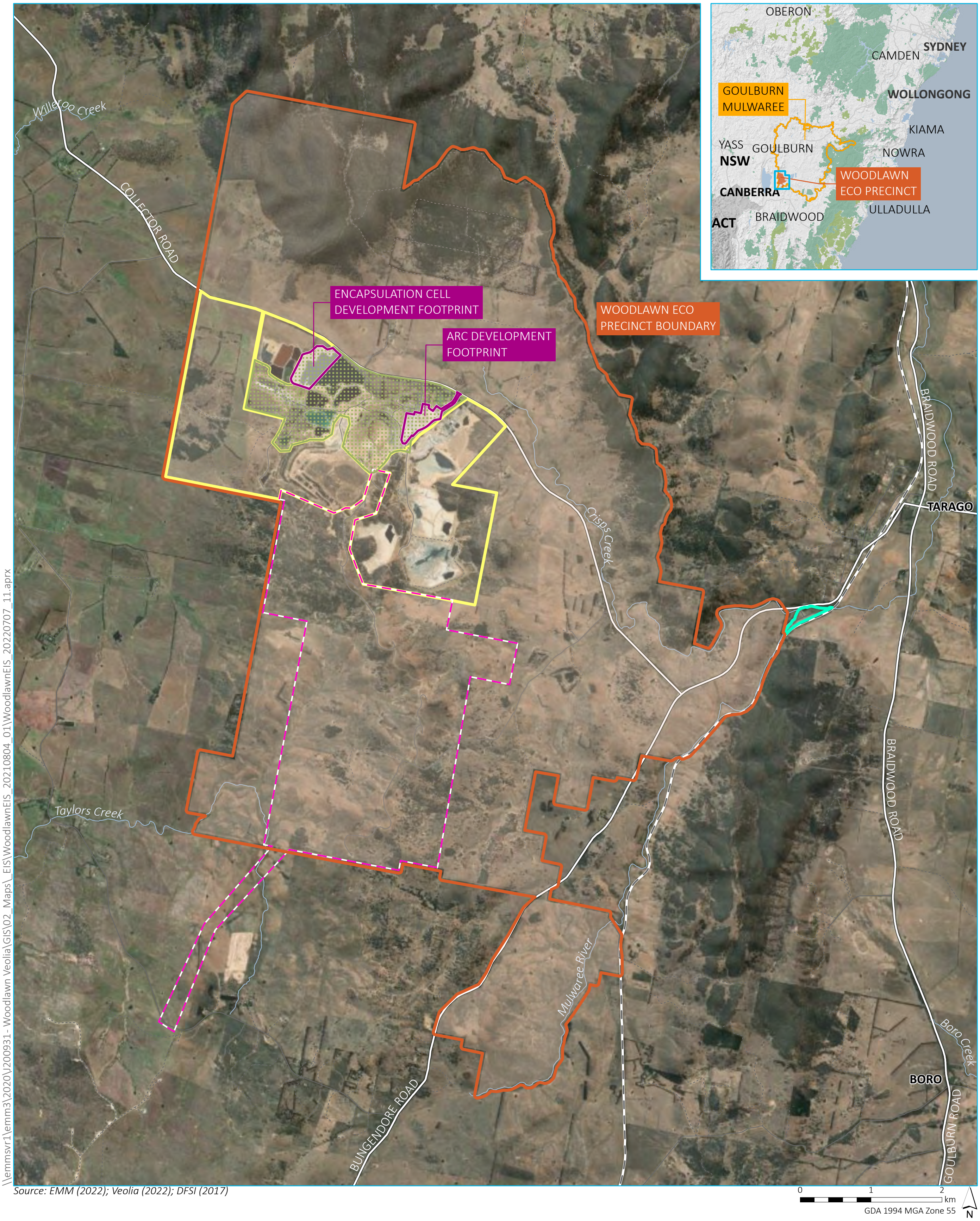
ES2 Strategic context

Energy from Waste is a new technology in Australia. However, it is well used overseas, with some 450 plants currently running in Europe. Veolia operates over 65 Energy Recovery Facilities (ERFs) overseas and will soon manage two more under construction in Perth, Australia.

Energy from Waste is recognised as a more sustainable waste management technique for residual waste than disposal to landfill. It provides for the recovery of the embedded energy within the waste stream, which contributes to a circular economy and the generation of low-carbon energy. At the same time, it redirects waste from landfill, preserving landfill capacity.

The NSW Government has recognised the need for Energy from Waste facilities in the recent Waste Management and Sustainable Materials Strategy 2041 (DPIE 2021a). Moreover, it has identified the need for one Energy Recovery Facility (ERF) to serve Greater Sydney by 2030 and three more by 2040. The Government also released the Energy from Waste Infrastructure Plan (EPA 2021b) in September 2021, identifying four locations in NSW as Priority Infrastructure Areas for Energy from Waste infrastructure. One is the Southern Goulburn Mulwaree Precinct, which is the location of the Eco Precinct.

Upon review by the NSW Chief Scientist, the NSW Government has updated its Energy from Waste Policy Statement (EPA 2021a) to include a set of stringent air quality criteria. Veolia has adopted these criteria for the ARC project, as indicated in the air quality assessment undertaken for this EIS.



Source: EMM (2022); Veolia (2022); DFSI (2017)

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Woodlawn ARC regional and local setting

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure ES1

creating opportunities

ES3 Woodlawn Advanced Energy Recovery Centre

The project ARC comprises the construction and operation of:

- the ARC building itself, containing:
  - the ERF for the thermal treatment of up to 380,000 tpa of residual waste feedstock (from residual municipal solid waste and commercial/industrial waste) that would otherwise be disposed to landfill; and
  - a power plant with a nominal capacity of 30 MWh to generate up to 240,000 MW of electricity per annum;
- an encapsulation cell for the on-site management of residual by-products generated by the ARC; and
- ancillary site infrastructures to facilitate the construction and operation of the project.

The surface disturbed by the project is presented in Figure ES2 and represents 38.4 ha in total. All works and disturbances for the project will occur either within the ARC development footprint located within Veolia's area of integrated waste management operations or within the encapsulation cell development footprint situated within an existing disturbed portion known as ED1, approximately 1.8 km to the north-west of the ARC building. The residual by-products generated by the ARC will be transported by truck from the ARC building to the encapsulation cell via the internal road network.

Figure ES3 provides an artist's impression of the ARC building, located within the ARC development footprint. The construction and operation hours for the project will be 24 hours per day, seven days a week. There will be no change in the approved volumes, or hours of operation, for the transport of waste to the Eco Precinct.

ES4 Engagement

Veolia has used various channels to actively engage with the community and stakeholders since the former mine went into administration in 1998, such as the community liaison committee (established in 2001), Veolia's Woodlawn website, community programs, newsletters, the community telephone line/email, or direct consultation with stakeholders. For the project detailed in the present document, extensive community and stakeholder engagement has been conducted, including with local, State and Commonwealth government agencies, Registered Aboriginal Parties, and neighbours. Veolia has hosted a series of onsite open days, online sessions during COVID, and a "meet-the-experts" session in Tarago. Four letterbox drops were made during the period April 2021 to May 2022. Additionally, Veolia has held meetings with immediate neighbours between April and August 2021 and March and May 2022.

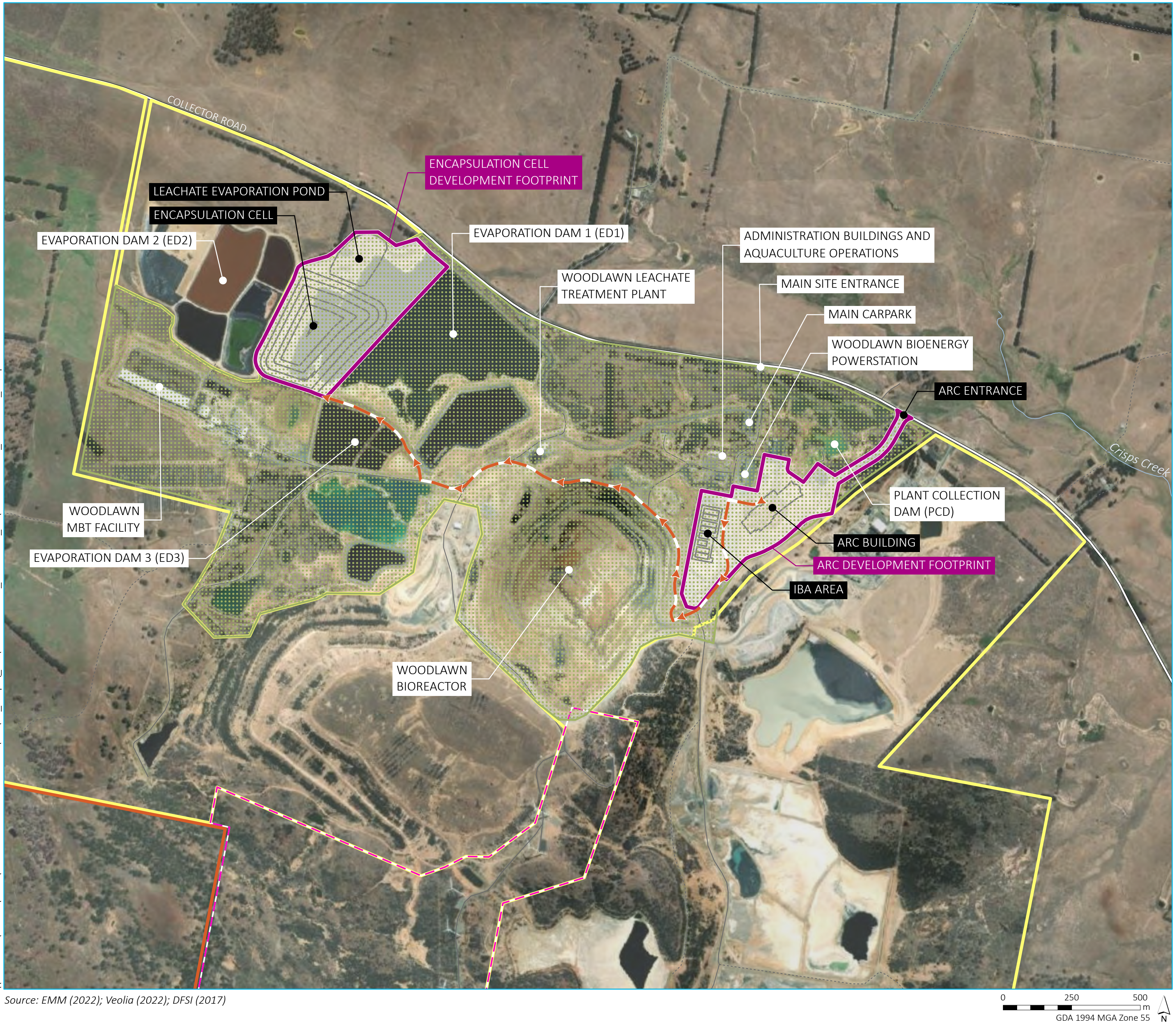
Key concerns raised by the community included:

- project-related emissions and existing odour issues;
- noise associated with additional truck movements;
- decreasing property values;
- negative perceptions of the community related to landfills;
- the presence of a non-local workforce;

- further deterioration of Tarago-Bungendore Road from continued truck movements; and
- road safety for users of the Tarago-Bungendore Road.

Veolia has considered the matters raised in the preparation of the present EIS. Veolia will continue its stakeholder engagement program to ensure issues raised by the community and other stakeholders are understood and addressed.

Future engagement and consultation activities for the project will include a public exhibition of this EIS, preparing a Submissions Report responding to the submissions received during this public exhibition, and further community information/drop-in sessions.



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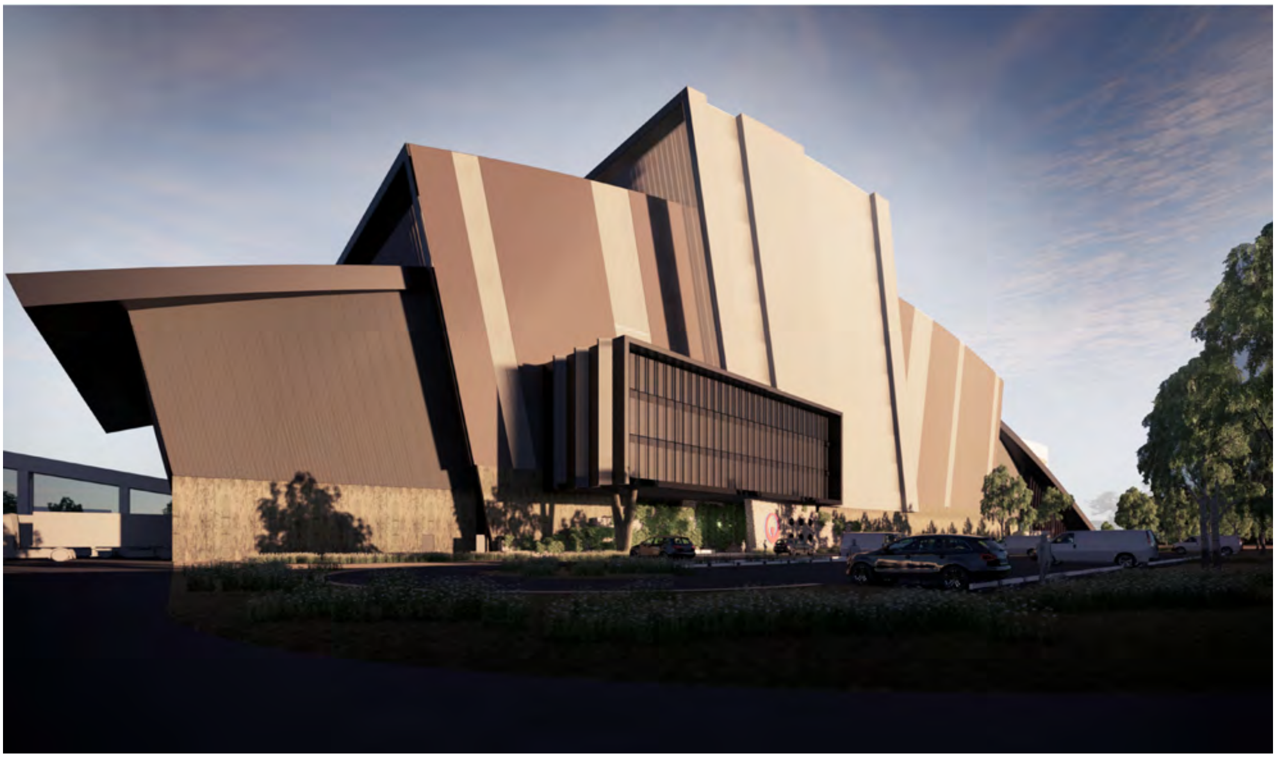
Source: EMM (2022); Veolia (2022); DFSI (2017)

Woodlawn ARC project layout

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure ES2

EMM creating opportunities



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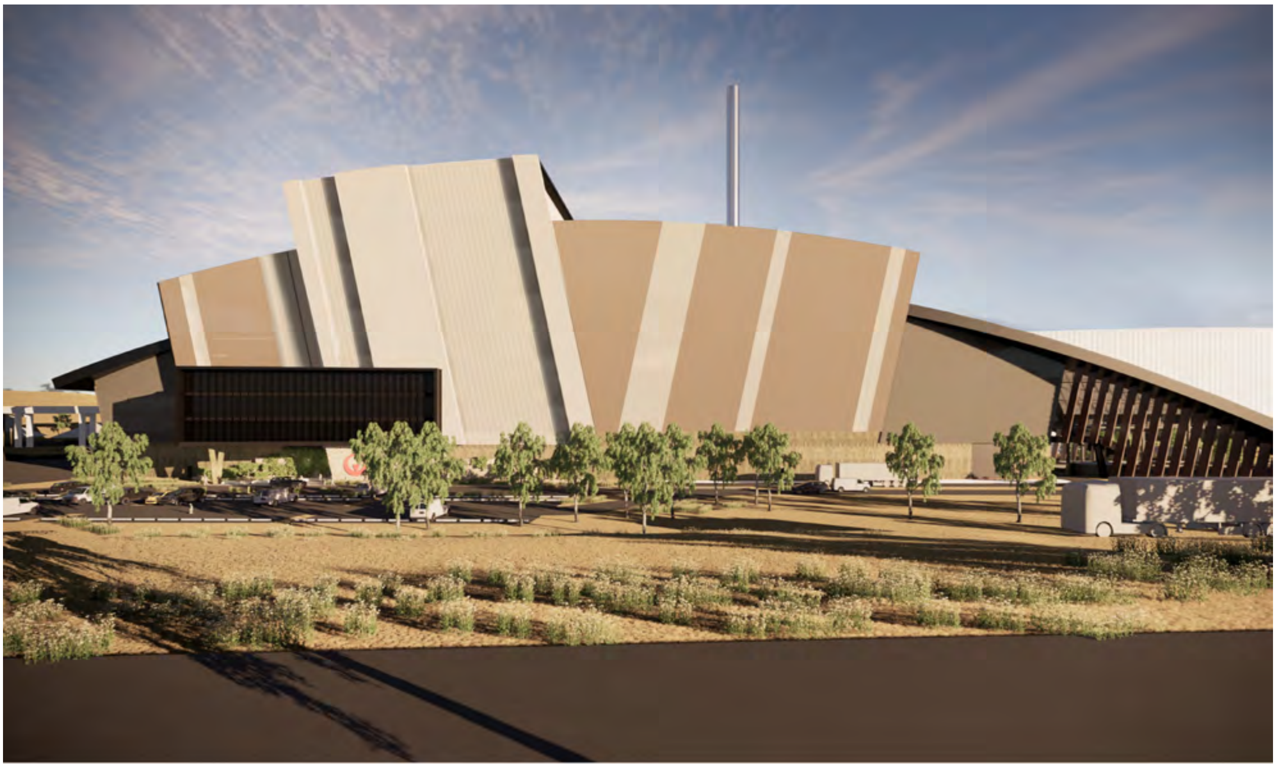

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Artist's impression of the ARC building

ES5 Assessment of impacts

Technical specialists have prepared a range of detailed technical assessments per the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment (DPE) on 2 July 2021, relevant legislation, policies and guidelines.

This EIS describes the assessment methods used, the existing environment, the predicted impacts of the project and the proposed management measures that Veolia will implement.

In NSW, waste management and resource recovery policies provide detailed criteria that proposed ERFs must meet. The requirements include demonstrating that the proposal represents international best practices, best available techniques and good neighbour principles. Veolia will abide by the applicable NSW legislation and critical guiding documents from the European Union when designing the project, to ensure that the project does not pose an unacceptable risk to human health or the environment.

The following sections summarise the outcomes of these technical investigations.

ES5.1 Air quality and odour

It is recognised that potential odour and air quality emissions from the project are a key concern for the community and other stakeholders.

The project will include a dedicated, purpose designed, air pollution control system, also known as a flue gas treatment (FGT) system. This FGT system has been assessed against the EU best available techniques (BAT) standards and found to comply.

The potential air quality impacts of the project were assessed using atmospheric dispersion modelling undertaken in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2017). Three emission scenarios were developed and the impacts of each were modelled. The scenarios included two 'reference case' scenarios using real-world emissions data from a comparable operational Veolia-owned EfW facility in the United Kingdom. The first represents expected emissions from the ARC under normal operations, and the second represents maximum (worst case) emissions. In addition, a third scenario represents the 'regulatory case', which adopted the new stringent emission limits documented in the NSW Energy from Waste Policy Statement (EPA 2021a).

The AQIA found that for all scenarios, all predicted concentrations and deposition rates are below the applicable impact assessment criterion at all surrounding privately-owned assessment locations. Furthermore, the cumulative impact results presented for the project scenarios are not significantly different from the results for the currently approved and existing operations at the Eco Precinct. This indicates that:

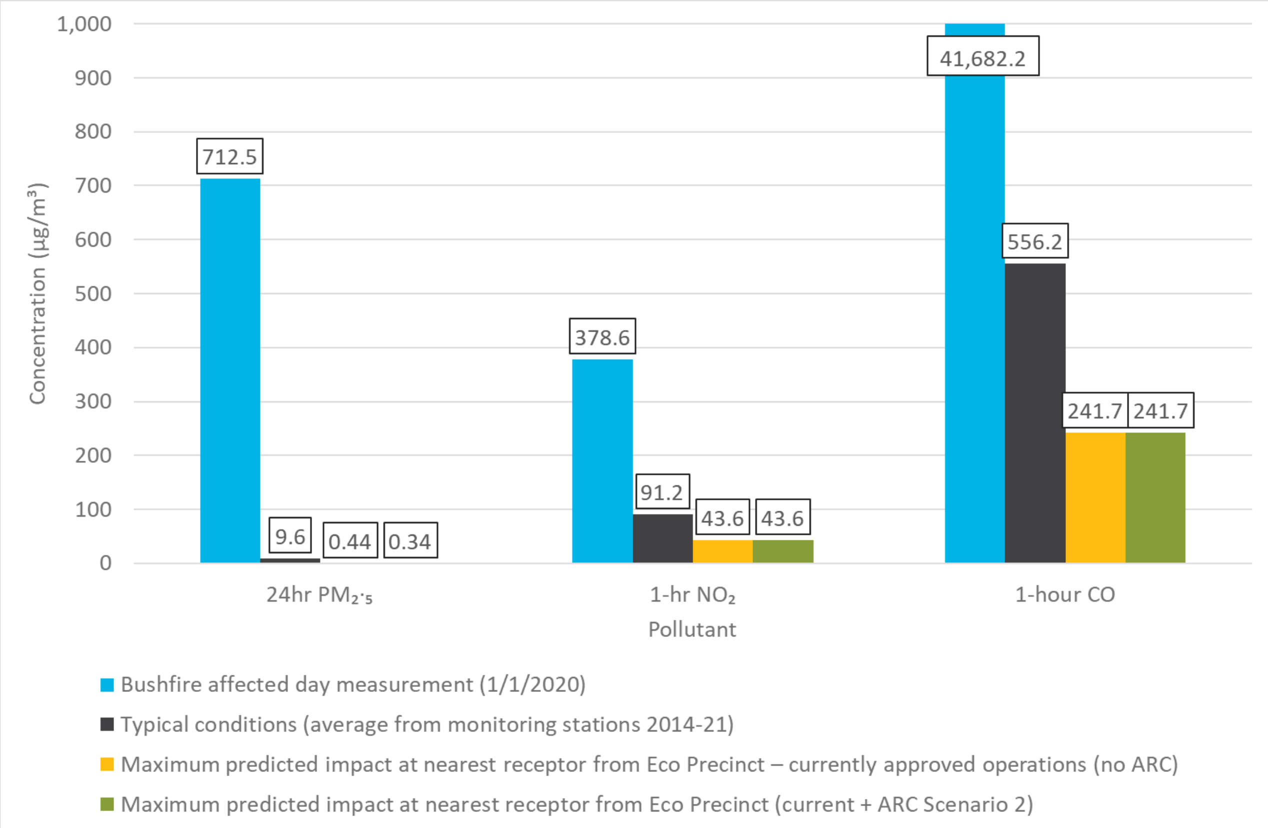
- the introduction of the project will not significantly change air quality impacts currently associated with the Eco Precinct; and
- relative to ambient background concentrations, air quality impacts associated with the Eco Precinct are minor at surrounding sensitive assessment locations.

To provide context to the modelling results, a comparison is presented in Figure ES4 below for three primary air pollutants. The comparison shows the concentrations for these pollutants:

- on a day heavily impacted by bushfires (1 January 2020) as measured at regional air monitoring stations;
- existing air quality in the region show as an average over the period 2014–2021 as measured at regional air monitoring stations; and

- the maximum emissions that will result from the ARC project under normal operations, at any sensitive receptor, such as a residence.

The predicted concentrations from the project are well below typical ambient air pollutant concentrations for the region and are negligible relative to a bushfire affected day for these three pollutants. The full range of potential pollutants are assessed in the AQIA.



Note: Y-axis is cropped at 1,000 µg/m3 for data visualisation purposes. The maximum 1 hour CO concentration from the dataset was 41,682.2 µg/m3.

Figure ES4 Comparison of regional ambient concentrations and predicted concentrations from the project

Given the community concerns about existing operations, odour was also assessed in the AQIA. The results indicate that all assessment locations are below the odour impact assessment criterion for both existing and future operations. In comparison to existing operations at the Eco Precinct (eg Bioreactor, MBT, leachate treatment etc), the addition of the ARC project is not predicted to increase the odour from the site.

As noted above, the ARC project includes a sophisticated, multistage FGT system designed to ensure the plant meets the strict requirements of the NSW Government. In addition, Veolia will implement a range of air pollution emission mitigation technologies and practices to minimise air pollutant emissions from the project. For the ERF process, these measures include:

- fully enclosed tipping hall with fast opening doors and negative air pressure extraction to minimise odour emission release;
- installation of an odour extraction and filtration system for the tipping hall to control odours when the furnace is not operational; and
- the handling and processing of incinerator bottom ash (IBA) material within a semi enclosed building.

Veolia recognises that odour from existing operations is causing concern to some in the community. Veolia has implemented an enhanced Woodlawn Eco Precinct Odour Management Strategy that is regularly updated through expert input as well as community feedback and results from the landfill gas monitoring program. The strategy includes routine odour audits, upgrade of landfill gas capture infrastructure, trials of odour treatment technology and regular updates through multiple mediums to the community on odour management initiatives.

Veolia will implement a comprehensive continuous emissions monitoring system (CEMS) and will establish a continuous ambient air quality monitoring program.

ES5.2 Human health

A human health risk assessment (HHRA) considered the potential impacts of the project on the health of the community surrounding the Eco Precinct. The key focus was on the emissions to air and their deposition as particulate matter. The HHRA considered all possible exposure pathways for contaminants to impact people including inhalation, dermal contact, uptake from drinking water (including residential water tanks), eating local produce and swimming or other contact with recreational water bodies.

The HHRA followed the principles outlined in the enHealth document Environmental Health Risk Assessment: *Guidelines for Assessing Human Health Risks from Environmental Hazards* (2012, Commonwealth of Australia, Canberra). The approach required the assessment of:

- how people may be exposed to emissions to air over short-term (acute) and long-term (chronic) (ie exposure assessment);
- the hazards posed by (or toxicity of) the chemicals present in the emissions (ie hazard or toxicity assessment); and
- calculation of potential risks to health or risk characterisation.

Figure ES5 presents an overview of the assessment approach detailed in relevant sections of the HHRA.

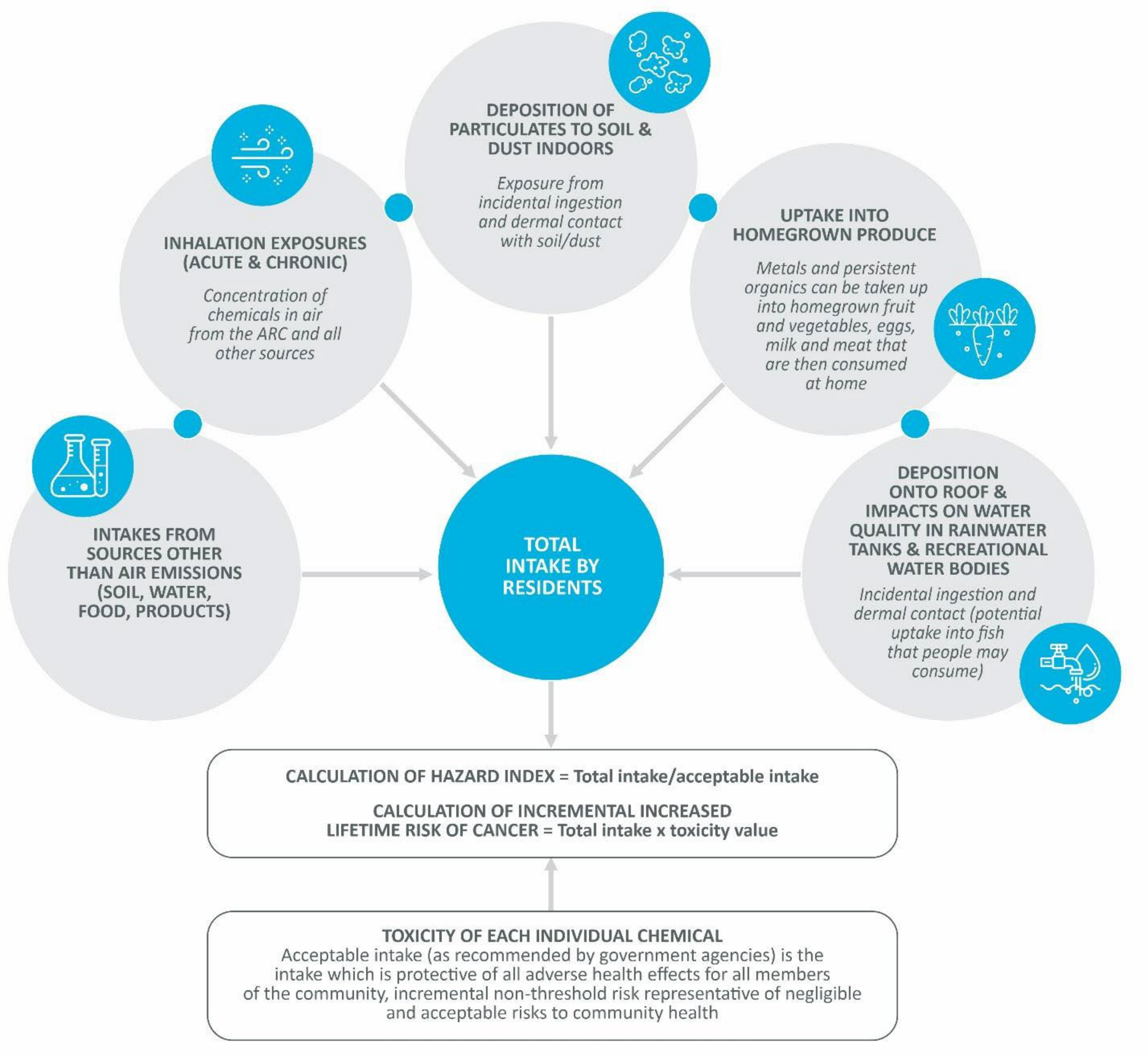


Figure ES5 Overview of human health risk assessment process

Using a set of highly conservative assumptions (such as 70 years of exposure) and following Commonwealth guidelines for human health risk assessment, the HHRA found that the risks for all exposure pathways (eg inhalation, dermal contact with soil, etc), as well as combinations of multiple exposure pathways, were well below the target risk levels and presented negligible risks for chronic or acute health impacts.

The assessment of risks arising from exposures to residential drinking water, recreational water, and crops from the area found that maximum predicted concentrations would be well below limits prescribed in the drinking water guidelines and food standards, including those for organic produce.

ES5.3 Greenhouse gas

A greenhouse gas impact assessment found that the project is predicted to generate net emissions of 74,611 tonnes (t) CO_2-equivalent per year. This was calculated after considering electricity generated by the project and exported to the grid which would represent a GHG offset. The emissions generated represent approximately 0.05% of total greenhouse gas (GHG) emissions for NSW and 0.01% of total GHG emissions for Australia, based on the Australian Greenhouse Emissions Information System for 2019. Importantly these emissions represent a decrease of 50% against the emissions which may result should the residual waste continue to be disposed at landfill (ie the do-nothing scenario), and the production of the equivalent electricity using coal. Therefore the overall impact of the project is to save approximately 74,000 tonnes (t) CO_2-equivalent per year, which is the equivalent to the emissions of approximately 32,400 cars in Australia.

ES5.4 Noise and vibration

A noise and vibration impact assessment found that noise levels from the operation of the project are predicted to comply with the relevant project noise trigger levels at the nearest noise sensitive locations. Similarly, construction noise levels from the project, including with sleep disturbance screening levels, will also comply at all assessment locations.

Vibration impacts from construction are highly unlikely given the significant distances between the closest proposed construction activities and nearest residences.

The future total road traffic noise levels, inclusive of trucks associated with the project, are predicted to satisfy the relevant road traffic noise criteria at the nearest potentially affected residences on Collector Road and Bungendore Road.

Cumulative noise levels were reviewed by considering the simultaneous operation of the project, other approved and operating developments at the Eco Precinct, including the Woodlawn Mine. The review confirmed that the project will not contribute to overall noise levels at any of the assessment locations.

ES5.5 Traffic and transport

The ARC is anticipated to process up to 380,000 tpa of residual waste feedstock. The feedstock will be sourced from the existing approved volumes that are transported to the Eco Precinct, and hence the project does not propose any increase in approved volumes of waste transported to the Eco Precinct. There will be other traffic movements associated with the project during operations, including heavy vehicles delivering clay for the ongoing development of the encapsulation cell, delivery of consumables (eg ammonia and activated carbon), future transport of incinerator bottom ash aggregates (IBAA) offsite, other incidental traffic movements (eg visitors for site tours) and workforce light vehicles.

The project will also generate traffic during the three-year construction period associated with the construction workforce and heavy vehicle movements. During this period, the project is expected to generate up to 70 inbound and 70 outbound vehicle movements per day, including 20 inbound and 20 outbound truck movements.

The traffic impact assessment modelled key intersections to assess how construction of the project would impact on network performance. The results indicated that there would be no significant impacts. The assessment also considered the mid-block capacity (a measure of a vehicle's average travel speed) at key locations. The results indicated that there would be minor impacts during the construction period, notably on Bungendore Road, before reverting to conditions like the current situation when the ARC is operational. This would indicate some additional delays on the hill climb travelling south from the Crisps Creek intermodal facility during peak hour on some days of the construction period.

The traffic impact assessment also found that the proposed ARC site access complies with the relevant Austroads guidelines for sight distancing and intersection design standards for intersection turn lanes. Truck queuing was also found to comply with the required queue lengths under the relevant Austroads guideline.

ES5.6 Groundwater

A groundwater impact assessment identified only minor impacts from the project. The excavation of the feedstock bunker at the ARC is expected to intercept groundwater for a short duration but would otherwise not impact groundwater assets such as existing bores or groundwater dependent ecosystems. The water take associated with intercepting groundwater during construction is minimal and is exempt from licensing requirements. Development of the encapsulation cell is expected to consolidate underlying clayey sediments, which may cause the groundwater level to rise gradually and locally, dissipating with distance and time. The assessment found that the potential effects of hydraulic loading on the groundwater system or excavation for the ARC bunker are not expected to have an adverse impact on the water quality of groundwater discharging towards Crisps Creek or the greater Sydney drinking water catchment.

Groundwater flows are expected to remain relatively unchanged because of the project. Groundwater quality changes because of the project are anticipated to be negligible and no cumulative groundwater impacts are predicted.

ES5.7 Surface water

The surface water management system for the project has been designed as a zero discharge system and integrates with Veolia's existing water management infrastructure at the Eco Precinct. Three water management objectives have been established to enable a clear and concise assessment of the project's residual impacts:

- Objective 1 – achieve a neutral or beneficial effect (NorBE) on the operational effectiveness of existing water management infrastructure;
- Objective 2 – achieve a NorBE on receiving water quality; and
- Objective 3 – provide a drought secure water supply for the project.

The surface water assessment for the project demonstrates that the project is able to achieve these objectives. No significant impacts to surface water resources are expected as a result of the project.

ES5.8 Contamination

A preliminary site investigation (PSI) has been prepared to assess the presence of contamination resulting from current and former land uses and the potential implications for the project. The primary source of existing contamination within the project's development footprint is heavy metals, largely related to past mining activities. In addition to metals, there is potential for acid formation through the oxidation of pyrite, and pyrrhotite. Contaminants of concern within the development footprint are largely associated with heavy metals from mining activities undertaken at the site from 1978 to 1998.

The rehabilitation of areas impacted by former mining activities within the development footprint are required under the existing Eco Precinct consents (DA 31-02-99 and MP10_0012, as modified). Rehabilitation (as required under existing development consents) will be implemented where required in accordance with those consents prior to construction of the project. The PSI concludes that land within the development footprint is either suitable in its current state for the project or will be suitable after any remediation or mitigation measures have been implemented.

ES5.9 Bushfire

The development footprint is partially mapped as bushfire prone (Vegetation Category 3 and buffer). The bushfire assessment identified that the project can be designed, constructed and operated in a manner that minimises risks associated with bushfire.

ES5.10 Biodiversity

The Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the Biodiversity Assessment Methods (BAM) (DPIE 2020). The development footprint has maximised the use of disturbed areas, which assists in minimising impacts to biodiversity. Of the 38.4 ha within the development footprint, 1.55 ha comprises native vegetation or habitat for threatened species. The ARC access road is the primary element of the project that impacts vegetation, and the footprint has been refined to minimise impacts as far as practicable, including the avoidance of a threatened ecological community (TEC).

Under the BAM, the project requires 31 ecosystem credits to offset impacts on native plant community types and ecosystem credit species. The BDAR has also considered impacts on species and ecological communities listed under the EPBC Act. The project is not expected to result in significant impacts on EPBC Act listed biodiversity matters.

Biodiversity impacts resulting from the project are not significant and have been minimised during the design process. Potential impacts will be managed through the implementation of management measures, and offsetting for residual impacts that cannot be avoided. The offset liability for the project will be met by Veolia and described in a Biodiversity Offset Scheme.

ES5.11 Aboriginal heritage

Fourteen registered Aboriginal parties were consulted as part of the preparation of an Aboriginal cultural heritage assessment. The assessment identified no Aboriginal objects, places or deposits within the development footprint. It further determined that the potential for encountering cultural material is considered unlikely given the historical and modern activities that have occurred.

The project was identified as being within a broader cultural landscape that encompasses important cultural places such as Lake George and Lake Bathurst. However, the project is not in close proximity, nor within sight, of these places. No cultural materials or site-specific intangible or cultural values were identified.

If there are unexpected finds within the development footprint, they will be managed in accordance with an Aboriginal Cultural Heritage Management Plan.

ES5.12 Historic heritage

A historical archaeological assessment found that the level of excavation and disturbance which has previously occurred at the development footprint will have removed or moved any remnants of relics prior to the development of the project. If there are unexpected finds within the development footprint, they will be managed in accordance with an unexpected finds protocol.

There is no listed built heritage within the development footprint, and it does not meet the criteria for a heritage site. Accordingly, the project will not impact any items of heritage significance.

ES5.13 Visual

A landscape and visual impact assessment considered the potential for visual impacts arising from the construction and operation of the project upon fourteen viewpoints. These viewpoints included nearby rural residences, roadways and highways, the Kevin Wheatley VC rest area, the Wairewa Lookout, and the locality of Tarago. The assessment found that one of the fourteen receiver viewpoints would likely experience a 'moderate to low' visual impact (Collector Road, north of the development footprint) and all other viewpoints would likely experience a 'negligible' visual impact. The project was also considered to have a limited potential to increase the significance of cumulative visual impact considering the presence of existing large scale visual elements (eg wind turbines) and due to visual screening surrounding the Eco Precinct for most receiver viewpoints.

ES5.14 Social

A social impact assessment (SIA) was prepared in accordance with the *Social Impact Assessment Guideline For State Significant Projects* (DPIE 2021) to identify potential impacts and opportunities which may arise from the project. In addition to the stakeholder engagement activities undertaken to date, the SIA process included an independent set of interviews, workshops, and an online survey. These activities were undertaken to identify values, vulnerabilities and strengths of the local community, as well as the identification of perceived impacts and benefits as a consequence of the project.

Some of the key concerns raised through the SIA engagement activities included project-related emissions and health impacts, the existing odour levels, increased noise associated with additional truck movements during construction, and road safety risks for users of the Tarago-Bungendore Road.

The project is considered to bring several positive impacts (benefits) to the local and regional communities, in particular continuing employment opportunities during construction and operation of the project and increased skilled career pathways.

ES5.15 Economics

An economic impact assessment found that the project is desirable and justified from an economic perspective. The project will provide direct economic activity, including jobs, and indirect economic activity to the local economy via wage and non-wage expenditure.

The project was found to contribute the following in the peak year of construction (2024):

- $227 million in annual direct and indirect regional output or business turnover;
- $98 million in annual direct and indirect regional value-added;
- $45 million in annual direct and indirect household income; and
- 603 direct and indirect jobs.

During operations the project is estimated to deliver the following incremental (ie compared to a do nothing scenario where 380,000 tpa of waste would continue to be disposed to landfill) annual contributions to the regional economy:

- $37 million in annual direct and indirect regional output or business turnover;
- $39 million in annual direct and indirect regional value added;
- $7 million in annual direct and indirect household income; and
- 120 direct and indirect jobs.

ES5.16 Hazards

A preliminary hazard assessment (PHA) has been prepared to assess any risks from the storage, handling and processing of hazardous materials at the project. It considered the range of materials required for the operation of the project including waste feedstock, fuel, additives and diesel. The PHA provided an evaluation as to whether the project should be defined as 'potentially hazardous industry' under the SEPP Resources and Energy 2021 and an assessment of risk acceptability from a land use safety and planning perspective. The PHA and project design has also been supported by a Fire Safety Study.

The PHA concluded that offsite effects due to fire or explosion involving dangerous goods and hazardous scenarios associated with the ARC operations were considered unlikely. The PHA consequence assessment confirmed that the impacts would be localised and contained on site. This was due to the proposed design measures and the separation distances to the site boundary. It is therefore unlikely that an accident event involving hazardous materials would have any effect that could extend offsite.

ES5.17 Waste

Several technical studies were undertaken to assess waste management impacts. The project will generate solid, liquid and gaseous waste streams.

Incinerator bottom ash (IBA) will be generated by the project from the combustion of residual waste feedstock. Up to 76,000 t is expected to be generated annually. IBA will be stockpiled at a maturation pad for a period of up to three months before disposal to landfill. In the future the matured IBA, or Incinerator Bottom Ash Aggregate (IBAA), may have a beneficial reuse as alternative daily cover material for the Bioreactor, as a rehabilitation material for application on site, or as a construction material for use by third parties (subject to further testing and approvals).

Air pollution control residues (APCr) will be generated in the boiler and by the flue gas treatment system in the ARC building. Up to 15,200 t is estimated to be generated annually. APCr will be stabilised within the ARC building before disposal within the proposed encapsulation cell.

The project will generate brine from the demineralisation plant which will be used in the ARC process water management system. Wastewater (sewage) from employee facilities will be treated and irrigated within the development footprint by a sub-surface drip irrigation system.

ES6 Evaluation of the project

This EIS has assessed the project as being consistent with the objects set out in clause 1.3 of the EP&A Act. It will also meet the principles of ecologically sustainable development outlined in Part 8 of the Environmental Planning and Assessment Regulation 2021.

Key findings are summarised below.

i Waste management strategy

The project meets the objective of the NSW Government to provide an ERF to serve Sydney by 2030, as set out in the NSW Waste and Sustainable Materials Strategy 2041 (DPIE 2021a), and will support the circular economy and the waste hierarchy by diverting some 380,000 tpa from landfill.

ii Site suitability

The site is zoned appropriately and has been identified by the NSW Government as an Energy from Waste Infrastructure Priority Area. In addition, the site has the benefit of a substantial Veolia owned buffer area to residences and other sensitive land uses, providing a separation of over 4 km. Finally, the site has been a major waste processing location for over 20 years and benefits from a major waste transport infrastructure system which has approval to move over 1 mtpa of waste to the site.

iii Environmental issues

The EIS has assessed all the potential environmental impacts that may result from the project. No substantial impacts have been identified that cannot be appropriately mitigated through management plans and other measures.

The project will generate low carbon energy generation for the equivalent of almost 40,000 homes, contributing to electricity generation from alternative energy sources with a lower global warming potential compared to other sources of energy generation (hard coal, biomass, natural gas).

iv Community

The assessment recognises that some in the community have concerns about the project, and the impacts of current operations at the Eco Precinct. All of the issues raised have been addressed in the EIS. It is noted there is also support for the project and its economic benefits and contributions to the community. Veolia has and will continue its community engagement program throughout all phases of the project.

ES7 Conclusion

The Woodlawn Eco Precinct is an important integrated waste management site for NSW, accepting some 40% of Sydney's putrescible waste. It forms a key component of a well-established waste management system operated by Veolia, supported by approved waste collection, sorting, transfer and transport infrastructure.

The project has been designed to:

- comply with waste policy in NSW by preserving landfill space, directing residual waste to a higher order option (energy recovery);
- minimise environmental impacts;
- use EfW technology that is demonstrated as 'best available technology' (or BAT); and
- complement existing land uses at the Eco Precinct consistent with land use zoning.

The ARC will achieve the following overall benefits:

- alignment with the Commonwealth, NSW waste policies and strategies and the regional plans;
- low carbon energy generation for the equivalent of almost 40,000 homes, contributing to electricity generation from alternative energy sources with a lower global warming potential compared to other sources of energy generation (hard coal, biomass, natural gas); and
- additional employment within the region, with direct and indirect employment benefits, including direct employment of up to 300 staff during construction and 40 staff during operation.

The project will result in environmental and social impacts as identified throughout the EIS, which will be managed through the mitigation and management measures described throughout, such that the project will not result in significant environmental or social impacts.

Through the project, there is an opportunity for increased community engagement with Veolia and implementation of community development initiatives, specifically targeting the local area. Potential partnerships with local community services and organisations will be available as a result of the project. It is considered that the Veolia's ARC project will provide long-term livelihood benefits from ongoing and increased employment, community investment and involvement, and training and apprenticeship opportunities.

On balance, the project is considered to be in the public interest.

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Chapter 1

Introduction

1 Introduction

1.1 Overview

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located on Collector Road, approximately 6 kilometres (km) west of Tarago, 50 km south of Goulburn and 70 km north of Canberra. The Eco Precinct is located in the Goulburn Mulwaree Council local government area (LGA). The regional setting is shown in Figure 1.1 and local setting is shown in Figure 1.2.

The Eco Precinct has provided sustainable and innovative waste management practices since 2004 and is critical waste management infrastructure for NSW, as it accepts some 40% of Sydney's residual putrescible waste. The Eco Precinct encompasses an area of 6,000 ha and comprises a major waste treatment and disposal complex incorporating the Bioreactor landfill, the BioEnergy Power Station operating on landfill gas, the mechanical biological treatment (MBT) facility, a solar farm and a wind farm. The Eco Precinct is connected to the Essential Energy electrical distribution network and electricity generated at the BioEnergy Power Station is exported to the grid. The Eco Precinct benefits from a significant Veolia owned buffer area, with the nearest privately owned residence being approximately 4 km from Veolia's integrated waste management operations area.

The Eco Precinct forms a key part of an integrated waste management operation, which also comprises two transfer terminals in Sydney (Clyde and Banksmeadow) where waste is sorted and loaded into purpose-built containers for transport by rail to Veolia's Crisps Creek intermodal facility (Crisps Creek IMF) at Tarago, and then on to the Eco Precinct by truck.

Veolia proposes to develop and operate the Woodlawn Advanced Energy Recovery Centre (ARC) (the project), an energy recovery facility (ERF), at the Eco Precinct. This involves the development of an additional waste management technology at the Eco Precinct, processing a portion of waste feedstock received at the Eco Precinct, and generating electricity from the energy recovery process which will be exported to the grid. The project is described in detail in Chapter 4. Existing operations at the Eco Precinct are described in Chapter 2.

Energy recovery from residual waste (known as 'energy from waste', or EfW) is a well-established and recognised waste management technology globally. In many countries, including Australia, it is acknowledged to be preferable to the practice of landfilling waste that cannot be recycled. As outlined in the *NSW Waste and Sustainable Materials Strategy 2041* (DPIE 2021a) (WASMS), "recovering energy from waste can be a necessary residual waste management option, delivering positive outcomes for the community and the environment, assisting in lowering our carbon footprint and reducing the need for landfill".

This environmental impact statement (EIS) has been prepared by EMM Consulting Pty Limited (EMM) on behalf of Veolia to support an application for development consent under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project has been classified as a State significant development (SSD) under the EP&A Act as it is both 'electricity generating works and heat or co-generation' (Section 20) and 'waste and resource management facilities' (Section 23) under Schedule 1 of the *State Environmental Planning Policy (State and Planning Systems) 2021*.

This EIS addresses the specific requirements provided in the Secretary's Environmental Assessment Requirements (SEARs) issued by Department of Planning and Environment (DPE) on 2 July 2021 (SSD-21184278) (Appendix A).

The EIS has been prepared in general accordance with the *State Significant Development Guidelines – preparing an environmental impact statement* (DPIE 2021b), *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021e), *Undertaking Engagement Guidelines for State Significant Projects* (DPIE 2021c), and the *Social Impact Assessment Guideline for State Significant Projects* (DPIE 2021f).

The EIS has been prepared in accordance with the form and content requirements specified in Part 8 of the NSW Environmental Planning and Assessment Regulation 2021 (EP&A Regulation).

1.2 The project

The project will involve construction and operation of the following key ARC components (refer to Chapter 4 for further detail):

- construction of the ARC, comprising an ERF for the thermal treatment of residual municipal solid waste (MSW) and commercial and industrial (C&I) waste (referred to as waste feedstock) that would otherwise be disposed to landfill;
- thermal treatment in the ARC of up to 380,000 tonnes per annum (tpa) of residual waste feedstock;
- installed capacity of up to 30 megawatts (MW) of electricity (generation of up to 240,000 megawatt hours (MWh) of electricity per annum);
- on-site management of residual by-products generated by the ARC, including construction of an encapsulation cell; and
- construction of ancillary infrastructure to facilitate construction and operation of the project, including a new access road.

Construction and operation of the project will be 24 hours per day, seven days a week.

The project will operate in conjunction with existing development consents and approvals at the Eco Precinct. In particular, the project relies on transport of waste to the Eco Precinct under existing development consents (refer to Section 2.3). The following aspects of the Eco Precinct's existing approved operations relating to transport of waste will **not** be altered by the project:

- Volume of waste received at the Eco Precinct.
- Mode of transport of waste received at the Eco Precinct – existing rail infrastructure will continue to be used to transport waste from the Banksmeadow and Clyde transfer terminals via the Crisps Creek IMF and then by truck to the Eco Precinct.
- Hours of operation for transport of waste to the Eco Precinct.

These aspects of the operations will continue in accordance with existing development consents (refer to Section 2.4). All other operations at the Eco Precinct will continue in accordance with their respective development consents.

1.3 Project objectives

The primary objective of this EIS is to inform the public, government authorities and other stakeholders about the project and the measures that will be implemented to mitigate, manage and or monitor potential impacts, together with description of the residual social, economic and environmental impacts.

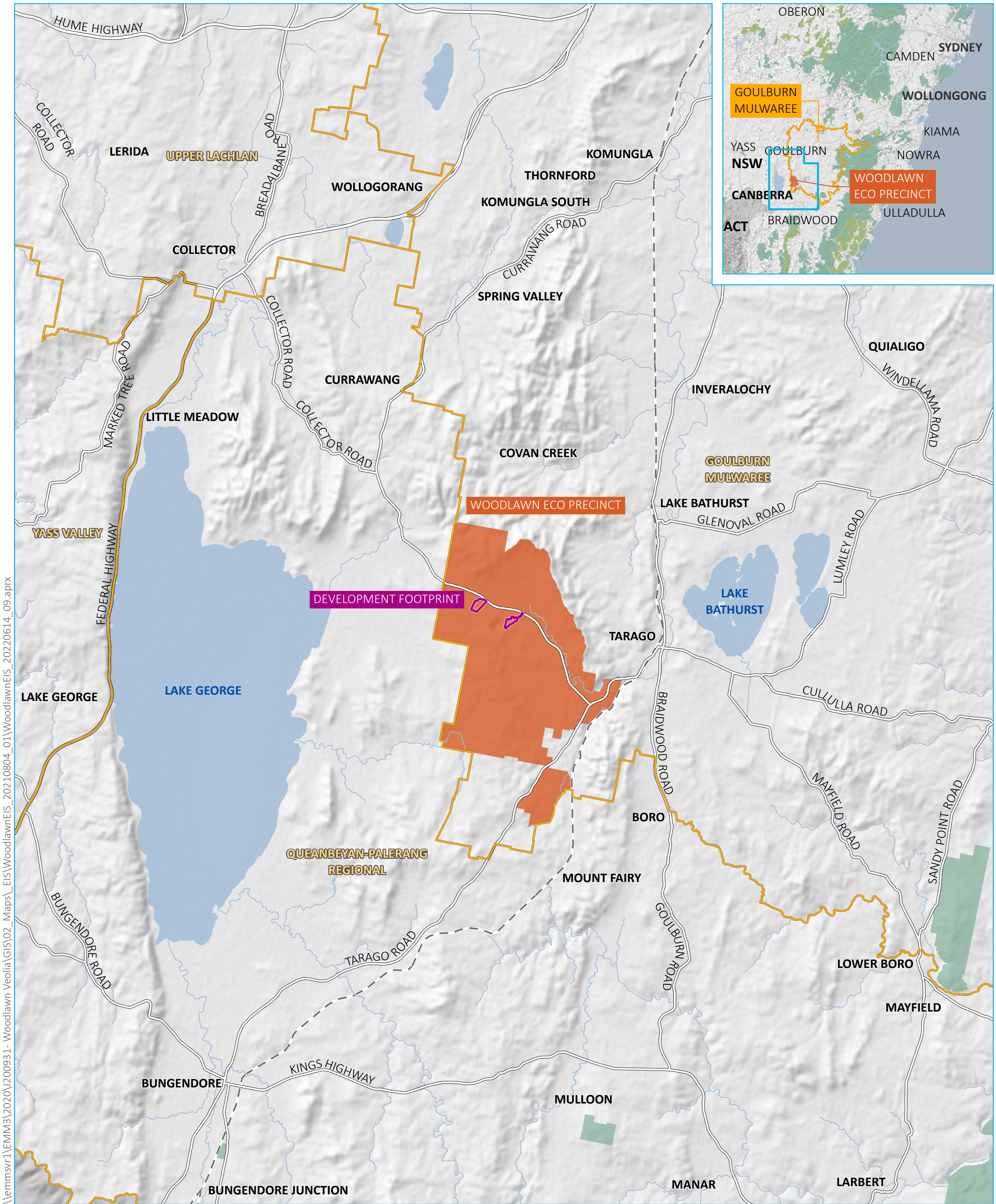
The project has the following key objectives:

- to support the *NSW Waste and Sustainable Materials Strategy 2041* (DPIE 2021a) and *NSW Energy from Waste Policy Statement* (EPA 2021a) (the EfW Policy Statement) in stimulating investment in best practice energy from waste facilities in NSW;
- supporting the circular economy by assisting to meet the Government's objective of 80% recovery from all waste streams by 2030 and instead creating low carbon energy, and recovering valuable metals and potentially generating materials for use in construction;

- providing greenhouse gas benefits by generating low carbon electricity and reducing the amount of waste disposed to landfill and associated methane emissions;
- contributing to decarbonising electricity generation in Australia;
- building on the success of the existing Eco Precinct, becoming a major contributor to investment in regional NSW, providing both indirect and direct employment opportunities during construction and operation and driving economic growth in the area;
- transforming residual waste feedstock into a valuable resource, by recovering energy, and thereby contributing to a circular economy; and
- demonstrating the local application of a well-proven technology that has been in operation throughout Europe, Asia and North America for many years, by an operator with extensive global experience in the technology.

The project will have the following benefits:

- creating over $600 million initial investment in regional NSW and a further $2 billion investment in lifetime maintenance and employment;
- increased capacity to recover energy from non-recyclable waste, while diverting up to 380,000 tpa from landfill;
- generation of up to 240,000 MWh of electricity per annum, of which up to approximately 220,000 MWh will be exported to the grid, enough to power up to 40,000 homes;
- a saving of net greenhouse gas emissions by around 74,000 tonnes (t) of carbon dioxide equivalent (CO_2 eq) per annum;
- generation of up to 300 jobs during construction and up to 40 jobs during operation, the majority of which are likely to be in the Goulburn Mulwaree LGA; and
- further investment in community initiatives.



Source: EMM (2022); Veolia (2022); DFSI (2017)

0 5 10 km
GDA 1994 MGA Zone 55
N

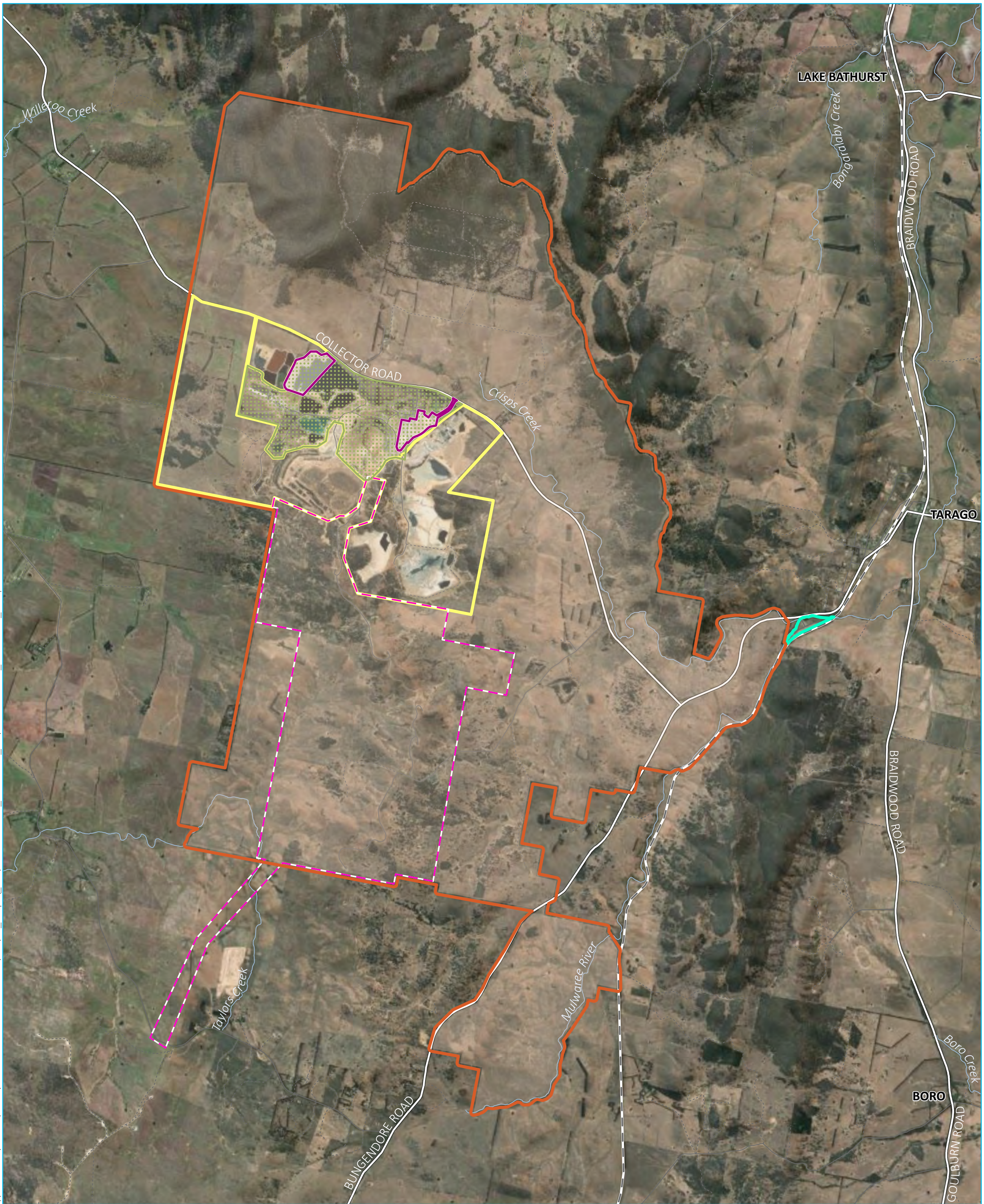
KEY

- Development footprint
- Woodlawn Eco Precinct
- Rail line
- Major road
- Watercourse
- Named waterbody
- NPWS reserve
- Local government area

Regional setting

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 1.1

creating opportunities



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Source: EMM (2022); Veolia (2022); DFSI (2017)

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Local setting

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 1.2

EMM creating opportunities

1.4 The applicant

The Veolia Group is a global leader in optimised resource management. Ecological transformation defines Veolia's purpose as an organisation and the potential impact Veolia has; enabling society to thrive whilst protecting and preserving the planet, natural resources and mitigating the impacts of climate change. With nearly 220,000 employees worldwide, the Group designs and provides water, waste and energy management solutions which contribute to the sustainable development of communities and industries. Through these three complementary business activities, Veolia helps to develop access to resources, preserve available resources, and to replenish them.

In 2020, the Veolia Group supplied 95 million people with drinking water, 62 million people with wastewater services, produced nearly 43 million MW hours of energy and treated 47 million metric tonnes of waste across the globe.

Veolia Australia and New Zealand (Veolia ANZ) is the largest environmental solutions organisation in Australia and New Zealand with combined water/wastewater treatment, energy management, waste and resource recovery services. Veolia ANZ employs 5,700 people and operates across more than 200 locations. Veolia Environmental Services (Australia) Pty Ltd (Veolia), the waste division of Veolia ANZ, is the applicant for this project.

The Applicant details are as follows:

Applicant name: Veolia Environmental Services (Australia) Pty Ltd

Australian Business Number (ABN): 20 051 316 584

Address: Level 4, 65 Pirrama Road, Pyrmont NSW 2009

1.5 Related development

1.5.1 Existing approved development

The Eco Precinct and its operations are supported by Veolia's existing integrated waste management services. The project will operate in conjunction with the following existing development consents and approvals:

- DA31-02-99/ MP 10_0012 (as modified) for the Woodlawn Waste Management Facility and Woodlawn Waste Expansion Project.
- DA205-08-01 (as modified) for the Clyde Transfer Terminal, approved to receive up to 600,000 tpa of putrescible and non-putrescible waste.
- SSD-5885 (as modified) for the Banksmeadow Transfer Terminal, approved to receive up to 500,000 tpa of putrescible and non-putrescible waste.

Copies of the above-mentioned development consents are provided in Appendix B.

1.5.2 Development required for the project subject to separate assessment

There is a possibility that electrical distribution infrastructure and associated augmentation works may be required to support this project (ie transmission/distribution lines), and if so, these will be subject to a separate environmental approval process. Veolia is investigating a range of options with regards to connection to the distribution network.

Essential Energy has a 66 kV transmission line from the Eco Precinct which extends approximately 37.5 km to Essential Energy's Goulburn Substation. Veolia has been liaising with Essential Energy to understand the potential modifications or upgrades that may be required to their existing managed electrical infrastructure network for the export of electricity generated at the ARC. Veolia has submitted a Detailed Enquiry to Essential Energy to further understand the design and the development requirements. This will ensure the necessary regulated requirements for connection will be met. All works will be consistent with the existing planning, easements and other asset management parameters in existence and any activities have the benefit of assessment and determination under Part 5 of the EP&A Act.

The works required will be determined by Essential Energy. At this early stage of the Detailed Enquiry process, Veolia is working to have any modifications or upgrades that may be required to the 66 kV transmission line, made within the capacity of the existing line where possible. Restringing of the line could potentially be required, with the intention of working within the existing easements that facilitate the current infrastructure.

A high-level environmental and social sensitivity analysis of this option has been undertaken and is included at Appendix N. Regardless of the level of works determined to be required, a detailed environmental impact assessment and determination under the EP&A Act will be required. This process will involve engagement with stakeholders for any proposed works associated with the transmission and distribution network.

1.6 Key terminology

For the purposes of this EIS, the following definitions have been adopted and are referred to in Figure 1.1 and Figure 1.2 and throughout the EIS.

Table 1.1 Key terminology

Terminology	Description
the Eco Precinct	The Woodlawn Eco Precinct, referring to the whole parcel of land owned and operated by Veolia, and including all the existing and proposed operations and buffer area. The Eco Precinct comprises 6,000 ha.
the project	The Woodlawn Advanced Energy Recovery Centre (ARC), an energy recovery facility (ERF). This refers to all of the elements that comprise the project for which approval is sought, as described in Chapter 4. For clarity, approval is not sought for electrical distribution infrastructure and/or associated augmentation works which will be required to support this project (ie transmission/distribution lines). These will be subject to a separate environmental approval process under Part 5 of the EP&A Act.
project area	Area of investigation, which was considered during the reference design development, and for the historical heritage, biodiversity, Aboriginal cultural heritage field survey assessment and design phase. It includes a broad area encompassing the ARC building, the incinerator bottom ash (IBA) area and the encapsulation cell. The air quality impact assessment and noise and vibration impact assessment refer to a wider study area, encompassing the closest sensitive receptors. The social impact assessment refers to two key study areas: a local study area and a regional study area.
development footprint	The extent of actual surface disturbance proposed by the project and assessed in the EIS.
the ARC	The ARC building and ancillary infrastructure, incinerator bottom ash (IBA) area, substation, access road, and internal access roads.
the ARC building	The fully enclosed ARC building which houses the energy recovery facility and associated facilities.
encapsulation cell	The portion of the project footprint encompassed by the dedicated lined and engineered landfill cell (and associated leachate evaporation pond) for the encapsulation of stabilised air pollution control residues (APCr) from the ARC flue gas treatment system.

Table 1.1 Key terminology

Terminology	Description
IBA area	The portion of the project footprint dedicated to the processing of incinerator bottom ash (IBA) into incinerator bottom ash aggregates (IBAA). The IBA area is used for the handling, processing and storage and maturation of IBA (and matured IBAA). The IBA area will consist of: • the IBA processing building; • IBA maturation pad (including maturation stockpiles); and • associated infrastructure for wastewater and leachate management.
Veolia's integrated waste management operations	This area encompasses Veolia's waste management operations which are approved under DA31-02-99 (as modified), MP06_0239 (as modified) and MP 10_0012 (as modified).
the Bioreactor	Woodlawn Bioreactor landfill approved under DA31-02-99 (as modified) and MP 10_0012 (as modified).
Woodlawn BioEnergy Power Station	Woodlawn BioEnergy Power Station approved under DA31-02-99 (as modified) and MP 10_0012 (as modified).
Crisps Creek IMF	Crisps Creek intermodal facility approved under DA31-02-99 (as modified) and MP 10_0012 (as modified).
MBT Facility	Woodlawn Mechanical Biological Treatment Facility approved under MP06_0239 (as modified).
Transfer terminals	Waste transfer terminals located at Clyde and Banksmeadow in Sydney, where residual waste is sorted, containerised and loaded onto rail for the trip to the IMF.

1.7 Structure of the report

This EIS consists of a main report and a series of appendices. The main report describes the project in the context of the existing environment, the planning framework, key environmental issues, potential impacts, proposed mitigation measures and residual impacts. It is informed by the technical assessments contained in Appendix C to Appendix FF and provides a summary of each technical assessment.

The SEARs are attached in Appendix A, with a reference to where each requirement has been addressed within this EIS.

The structure of the EIS is summarised in Table 1.2.

Table 1.2 EIS structure

Chapter	Content
Preliminary	• EIS certification. • Summary.
Chapter 1: Introduction	Introduces the project and the applicant; provides a brief discussion on the background of the project; discusses the objectives and benefits of the project; and outlines the document structure.
Chapter 2: Existing operations	Provides a description of the previous and existing activities at the Eco Precinct and the history of the planning approvals.
Chapter 3: Strategic context	Describes the strategic justification of the project; provides a brief overview on the regional context of the project and site suitability; and discusses the feasible alternatives to the project.
Chapter 4: Project description	Describes the project including construction and operational parameters, as well as the project location.
Chapter 5: Statutory context	Identifies the relevant State and Commonwealth environment and planning legislation and regulations, waste management legislation, the applicable local and regional environmental planning instruments and discusses other approvals and permits that may be applicable to the project.
Chapter 6: Application of NSW EfW policy	Provides a summary of the project's compliance with the NSW EfW Policy.
Chapter 7: Engagement	Describes the engagement strategies for the project and details how consultation has been addressed in the EIS.
Chapter 8 (Sections 8.1–8.17): Assessment of impacts	These chapters assess key environmental issues, identifying the potential impact of the project. A description of the management measures proposed to mitigate and reduce potential adverse environmental risk of the project and /or offset any unavoidable impacts are provided.
Chapter 9: Justification of the project	Summarises the evolution of the project design; strategic justification; statutory compliance; alignment with community views; the project impacts; cumulative impacts; how compliance will be ensured; key uncertainties, proposed mitigation measures; and conclusions.
Abbreviations and References	Contains abbreviations and references used in this EIS.
Appendix A	SEARs compliance table
Appendix B	Consolidated consents for the Eco Precinct
Appendix C	Woodlawn ARC design report
Appendix D	Woodlawn ARC Process Overview
Appendix E	Ash management study
Appendix F	Encapsulation cell design report
Appendix G	Preliminary waste acceptance protocol Waste delivery plan Sampling Analysis and Quality Plan
Appendix H	Woodlawn ARC Commissioning – Outline Plan
Appendix I (i)	Waste feedstock analysis
Appendix I (ii)	Chlorine content analysis
Appendix J	Statutory compliance table

Table 1.2 EIS structure

Chapter	Content
Appendix K	Project engagement
Appendix L (i)	BAT and reference facility assessment report
Appendix L (ii)	Woodlawn ARC reference facility review
Appendix M	Mitigation measures summary table
Appendix N	Transmission line environmental and social sensitivity analysis
Appendix O	Air quality and odour impact assessment (AQIA)
Appendix P	Human health impact assessment (HHRA)
Appendix Q	Greenhouse gas impact assessment (GHG impact assessment)
Appendix R	Life cycle analysis (LCA)
Appendix S	Noise and vibration impact assessment (NVIA)
Appendix T	Traffic impact assessment (TIA)
Appendix U	Groundwater impact assessment (GWIA)
Appendix V	Surface water impact assessment (SWIA)
Appendix W	Preliminary site investigation (PSI)
Appendix X	Bushfire protection assessment
Appendix Y	Biodiversity development assessment report (BDAR)
Appendix Z	Aboriginal cultural heritage assessment (ACHA)
Appendix AA	Historical archaeological assessment (HAA)
Appendix BB	Landscape and visual impact assessment (LVIA)
Appendix CC	Social impact assessment (SIA)
Appendix DD	Economic assessment (EA)
Appendix EE	Preliminary hazard analysis (PHA)
Appendix FF	Fire safety study (FSS)
Appendix GG	Operational data from Staffordshire ERF (Four Ashes facility)

Chapter 2

Existing operations

2 Existing operations

2.1 Overview of the Eco Precinct

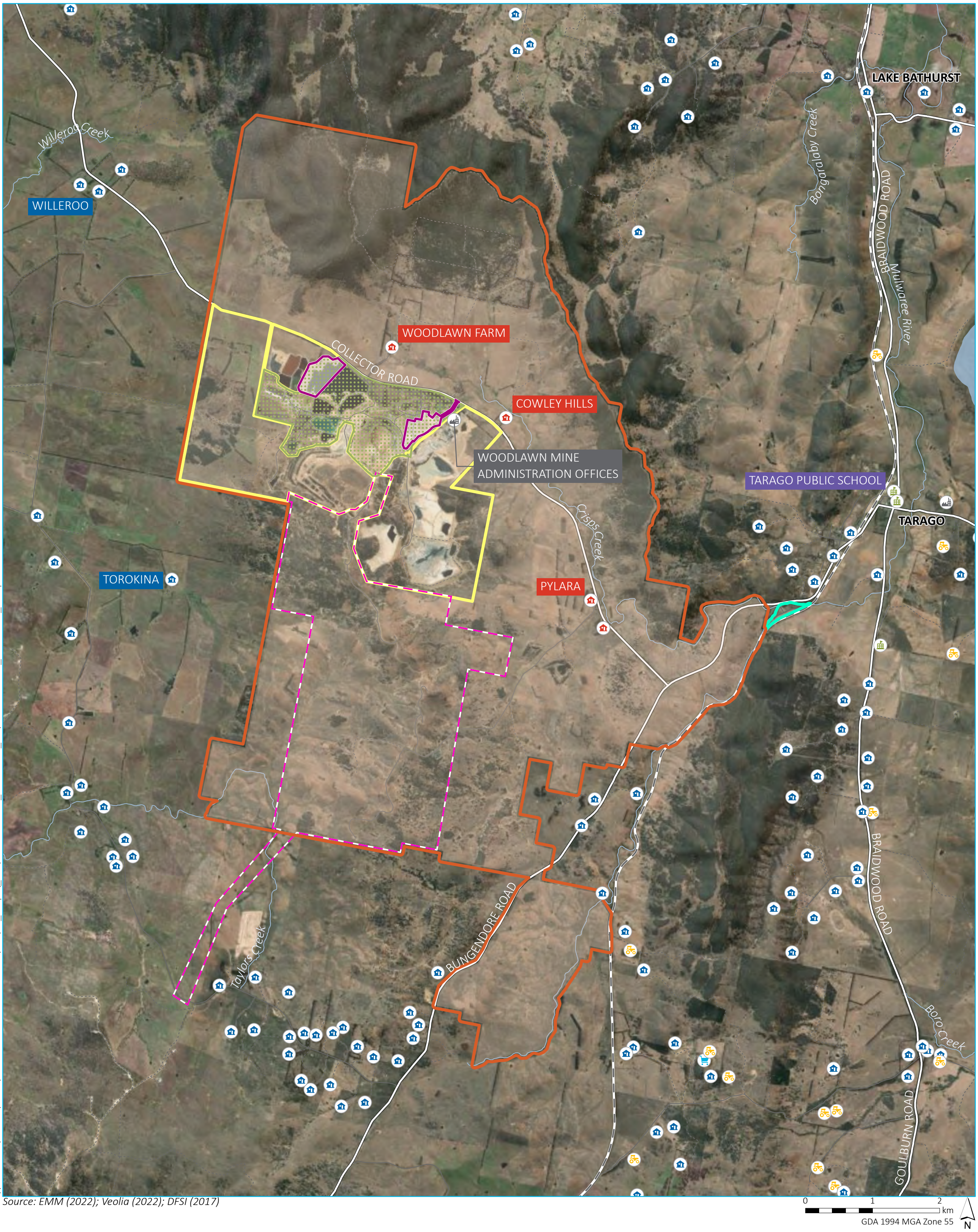
The Eco Precinct is an amalgamation of landholdings totalling approximately 6,000 ha in area, owned by Veolia. Within the Eco Precinct, Veolia's integrated waste management operations comprise an area of approximately 300 ha, shown in Figure 2.1. Waste management operations, energy recovery technologies and energy generation, and other sustainable land uses within the Eco Precinct, as shown in Figure 2.1, include:

- Woodlawn Bioreactor (the Bioreactor) – a landfill in which leachate is recirculated to help bacteria break down the waste, enhancing the early generation of gas, enabling more efficient capture and extraction of landfill gas, including leachate and landfill gas management systems.
- Woodlawn BioEnergy Power Station – utilises landfill gas from the Bioreactor to generate electricity.
- Woodlawn Mechanical Biological Treatment (MBT) Facility – processes garden organics and MSW to extract the organic content for use in tailings dam remediation.
- Agriculture – a working farm (sheep and cattle) that applies sustainable management practices.
- Aquaculture and horticulture – operation which uses captured heat from the BioEnergy Power Station for use in sustainable fish farming and hydroponic horticulture at the Eco Precinct.
- Renewable energy generation – the Woodlawn Wind Farm (operated by Iberdrola), with an installed capacity of 48.3 MW, and a solar farm (operated by Veolia) with an installed capacity of 2.3 MW.

The Eco Precinct is served by the Crisps Creek IMF near Tarago. Crisps Creek IMF is located approximately 6 km to the east of the Eco Precinct (8.5 km by road), shown in Figure 2.1. Integrated waste management operations are augmented by two waste transfer terminals located in Sydney: the Clyde Transfer Terminal, which commenced operation in 2004, and the Banksmeadow Transfer Terminal, which commenced operation in 2016. The Eco Precinct, Crisps Creek IMF and Sydney transfer terminals are shown in Figure 2.2.

Waste is transported from the Sydney transfer terminals in purpose-built shipping containers by rail via the Goulburn-Bombala Railway line to the Crisps Creek IMF. The Crisps Creek IMF has an approved throughput of 1.18 million tpa. On receipt at the Crisps Creek IMF, containers are loaded on to trucks for delivery to the Eco Precinct. Waste from the regional area is also approved to be transported to the Eco Precinct by road, up to 130,000 tpa (with written consent).

The Woodlawn Mine, a copper, lead and zinc ore mine, is also approved to operate within the Eco Precinct, with surface infrastructure immediately to the east of Veolia's integrated waste management operations, shown in Figure 2.1. The Woodlawn Mine is discussed further in Section 2.3.1 and 2.4.3.



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Source: EMM (2022); Veolia (2022); DFSI (2017)

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm

Assessment location

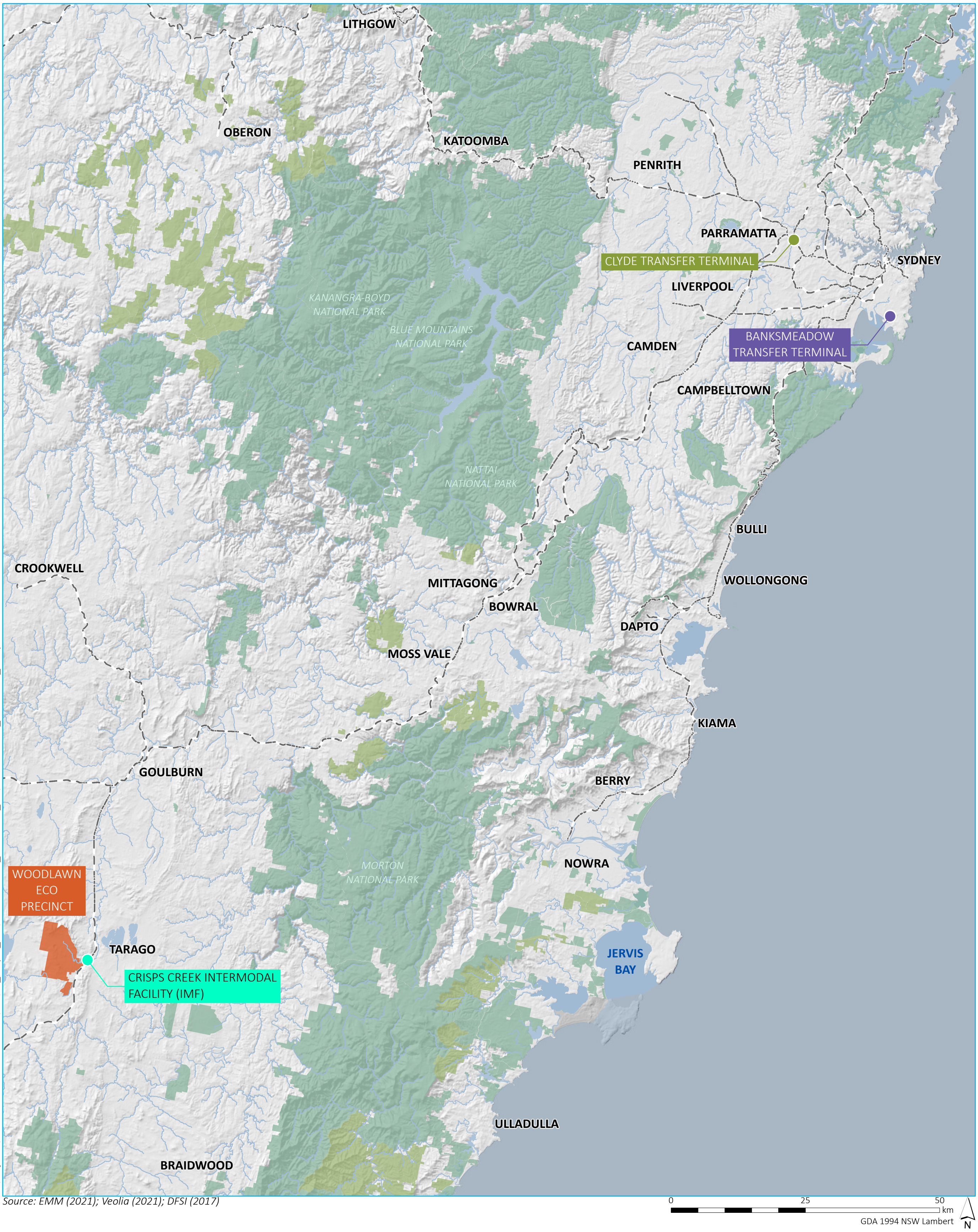
- Agriculture
- Community/school
- Commercial
- Industrial
- Residential
- Veolia

- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Eco precinct overview

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 2.1

EMM
creating opportunities



Source: EMM (2021); Veolia (2021); DFSI (2017)

KEY
- Woodlawn Eco Precinct
- Banksmeadow transfer terminal
- Clyde transfer terminal
- Crisps Creek Intermodal Facility (IMF)
- Rail line
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Veolia's waste transfer terminals

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 2.2

EMM
creating opportunities

2.2 Key features of the site and surrounds

The Eco Precinct is located in the Goulburn Mulwaree LGA on Collector Road, approximately 6 km west of the village of Tarago, and 50 km south of Goulburn, as shown in Figure 2.3. Other nearby villages and towns include Collector 20 km to the north-west, Lake Bathurst 9 km to the north-east and Bungendore 24.5 km to the south-west.

The locality surrounding the Eco Precinct contains a variety of landscapes within a broader agricultural setting. Most of the local and sub-regional setting has been cleared for grazing and/or cultivation with a range of scenic values and vistas. There are no major National Parks, nature reserves, conservation areas and State forests close to the Eco Precinct, with the closest National Parks approximately 17 km to the south-east and 24 km to the west, shown in Figure 2.3.

Land surrounding the Eco Precinct is relatively flat, apart from a ridge that is approximately 3 km north of the project and which rises about 200 m above the majority of the Eco Precinct. Lake George, approximately 7.5 km west of the Eco Precinct, is a prominent visual feature in the surrounding landscape, but is not visible from the project site or the eastern part of the Eco Precinct. The turbines of the Woodlawn Wind Farm, part of the Eco Precinct, are also a prominent visual feature.

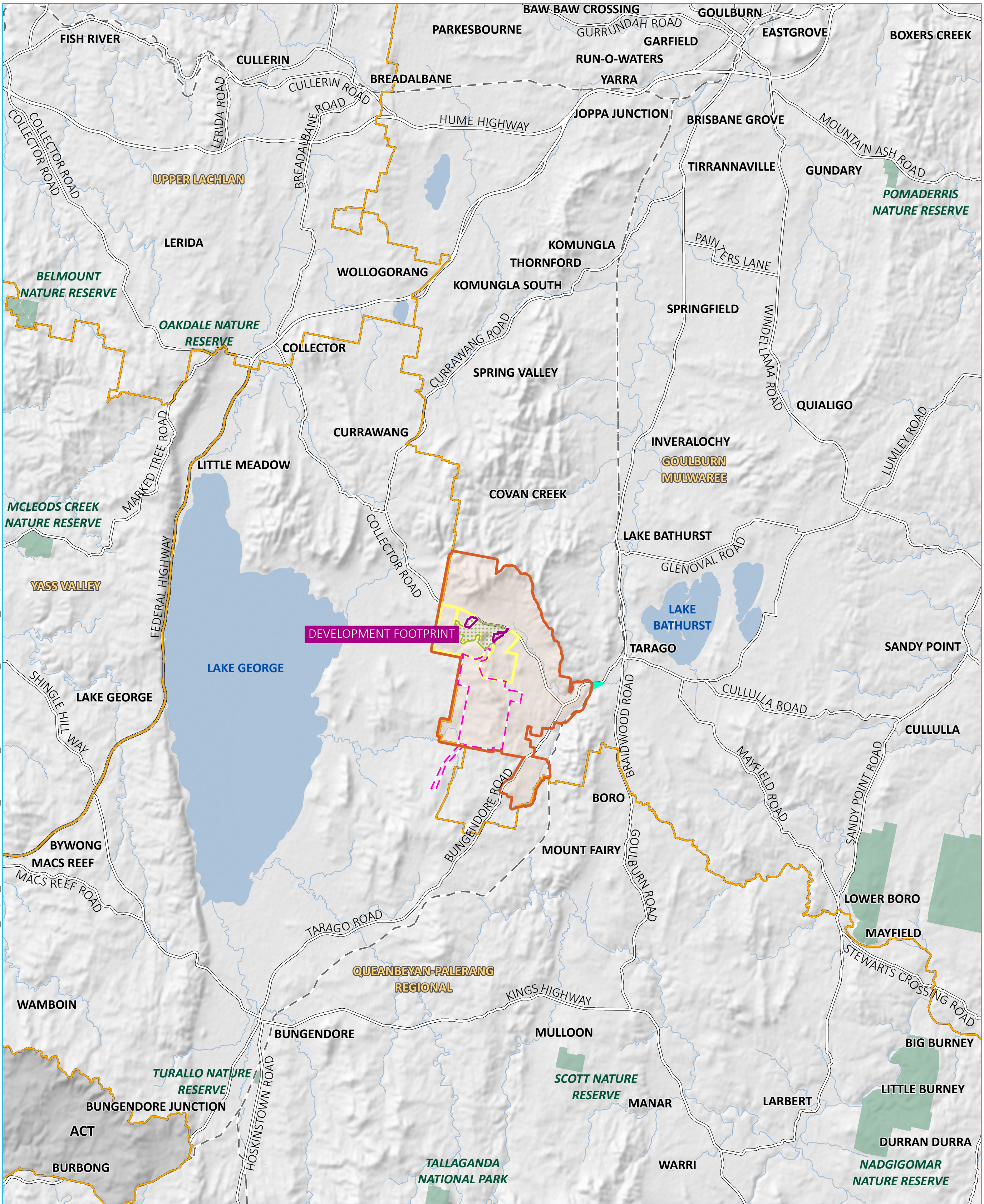
The Eco Precinct has an average elevation of approximately 800 m above Australian Height Datum (AHD) across the site with a maximum of 1,000 m AHD in the north-eastern corner along the ridgeline of the Great Dividing Range. The region is characterised by undulating plains with the Great Dividing Range running through the Eco Precinct in a north-south alignment.

The Eco Precinct sits across the Great Dividing Range with the western portion situated in the headwaters of the Lake George and Wollondilly River catchment via Allianoyonyiga Creek, whilst the eastern portion drains to the Mulwaree River catchment via Crisps Creek. The Crisps Creek catchment is part of the Water NSW regulatory area. Other prominent water features include Lake George and Lake Bathurst approximately 9 km to the north-east of the Eco Precinct (see Figure 2.3).

The Eco Precinct incorporates the former Woodlawn and Pylara farms, which include a number of dwellings (owned by Veolia), known as ‘Woodlawn’, ‘Pylara’ and ‘Cowley Hills’, shown in Figure 2.4, as well as land subject to past and current mining operations and associated rehabilitation activities. Land owned by Veolia immediately surrounding Veolia’s integrated waste management operations provides a buffer between operations and surrounding private properties.

The land use zoning of the Eco Precinct under the Goulburn Mulwaree LEP is predominantly IN3 Heavy Industrial, which includes the majority of the waste management, energy generation and mining activities, with the balance zoned RU2 Rural Landscape. Land immediately to the north and south is zoned RU2 Rural Landscape, land to the west is zoned RU1 Primary Production, and land to east, which incorporates the village of Tarago, is zoned a combination of RU5 Village, RU6 Transitional, RU1 Primary Production and E3 Environmental Management. Land use zoning is shown in Figure 2.4 and described in Section 5.3).

The nearest privately-owned dwellings, described as sensitive receptors, are shown in Figure 2.4. The nearest sensitive receptors to the project are the dwellings on the properties ‘Torokina’ and ‘Willeroo’, approximately 4.1 km to the south-west and 5.8 km to the north-west (Figure 2.4). The village of Tarago is approximately 6 km to the east of the project, and includes sensitive uses including a school, commercial premises, recreation areas as well as residential properties (Figure 2.4). In 2021 the local area had a total population of 1,139, comprising a population of 510 in Tarago State Suburb (SSC), 218 in Lake Bathurst SSC, 167 in Currawang SSC and 244 in Mount Fairy SSC (ABS 2021).



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Source: EMM (2022); Veolia (2022); DFSI (2017)

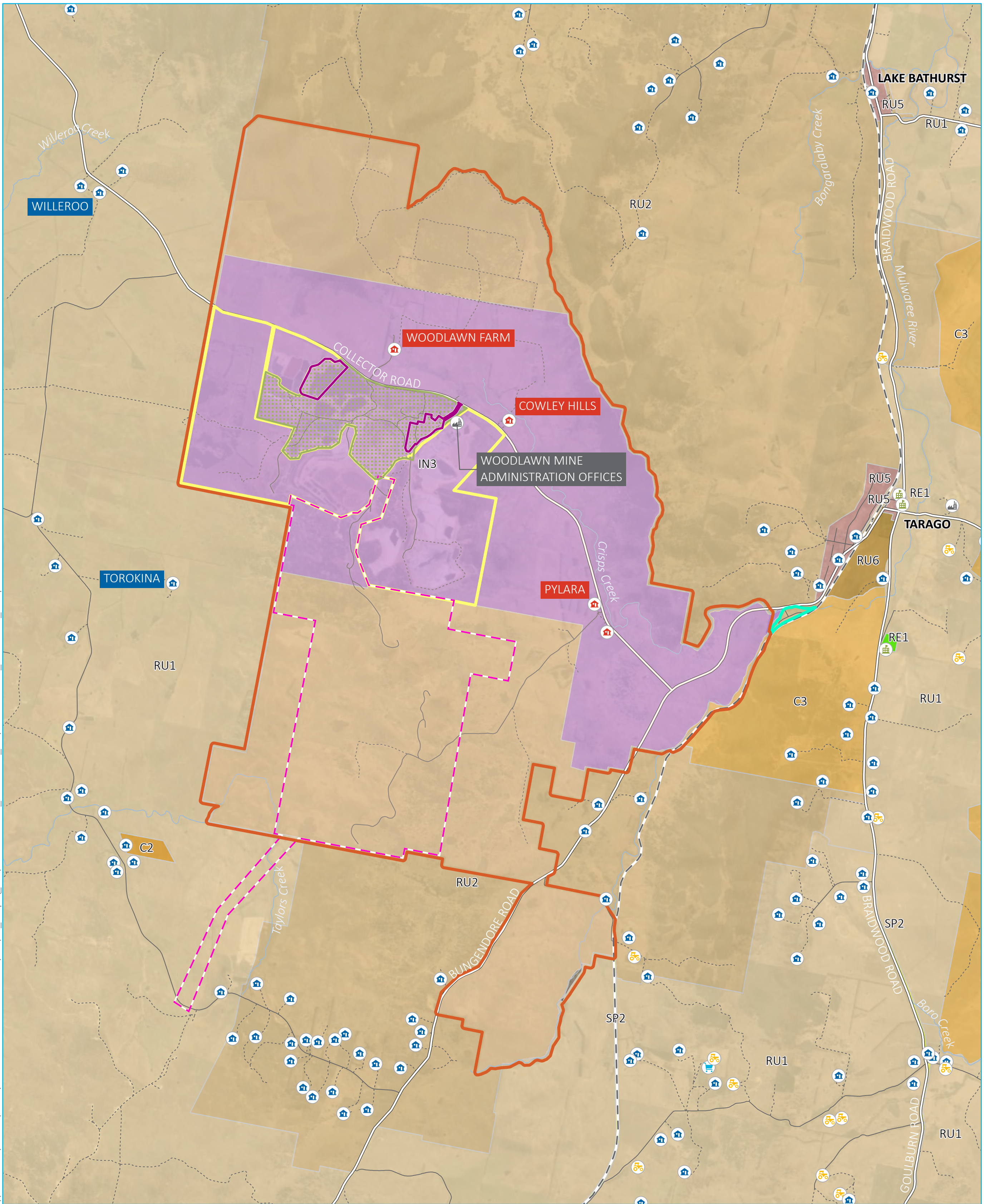
KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Watercourse
- Named waterbody
- NPWS reserve
- Local government area

Key features of the region

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 2.3

creating opportunities



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Source: EMM (2022); Veolia (2022); DFSI (2017)

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Assessment location

- Agriculture
- Community/school
- Commercial
- Industrial
- Residential
- Veolia

Land zoning

- C2 Environmental conservation
- C3 Environmental management
- IN3 Heavy industrial
- RE1 Public recreation
- RU1 Primary production
- RU2 Rural landscape
- RU5 Village
- RU6 Transition
- SP2 Infrastructure

Local land uses and sensitive receptors

Figure 2.4

The Eco Precinct is serviced by the local and regional road networks, including Collector Road, Bungendore Road and the Federal Highway. Bungendore Road and Collector Road are used by trucks transporting waste from the Crisps Creek IMF to the Eco Precinct under existing operations.

The town of Tarago has no views of the Eco Precinct. When travelling west from Tarago along Collector Road, views of the Eco Precinct are interspersed with roadside and more distant vegetation between the road and the project.

2.3 Eco Precinct history

2.3.1 Woodlawn Mine

Mining in the Eco Precinct area occurred in two separate periods: from 1978 to 1998, and from 2017 to 2020.

Development of an open cut pit to mine gold, silver, zinc, lead and copper on land that now forms part of the Eco Precinct commenced 1978. In 1987 the mine was purchased by Denehurst Pty Ltd who extended the operations to underground mining and tailings reprocessing. The open cut mine void was approximately 200 m deep and 700 m wide, while underground mining extended 460 m below the base of the pit (Golder 2021b). Mining operations ceased in 1998.

While mining operations ceased in 1998, the rights to Special Mining Lease (SML) 20 encompassing the Eco Precinct, were transferred to Heron Resources in 2014 under an agreement with Veolia. Development consent under the EP&A Act (MP 07 0143 as modified) for the Woodlawn Mine was granted in 2013 for mining operations for a period of 21 years in SML 20. SML 20 and the Woodlawn Mine operations area are shown in Figure 2.1 and Figure 2.3). Operations commenced in 2015, however mining ceased in March 2020 and Heron Resources went into voluntary administration in July 2021 with operations reduced to care and maintenance activities. The mine has recently been acquired by DEVELOP Global Ltd (DEVELOP), who is the current mine operator for SML20.

At full capacity, Woodlawn Mine is approved to extract and process up to 1.5 million tonnes (t) of tailings or 1 million t of underground ore per year, to produce copper, lead and zinc concentrates for up to 21 years. The Woodlawn Mine surface infrastructure area and tailings dams are located to the east of Veolia's integrated waste operations, shown in Figure 2.1. Underground mine workings are approved to be developed below areas within Veolia's integrated waste management operations area. Former underground mine workings are also present below parts of the site.

A rehabilitation trial on an existing tailings dam, Tailings Dam North within the Woodlawn Mine operations area, commenced in April 2021. The rehabilitation method involves the use of 'Woodlawn Organic Output', a product produced by Veolia at the MBT facility. The Woodlawn Organic Output has been used in on-site potting trials to determine the optimum blend for germination and survivability for a range of native plant species. The EPA granted Veolia a Resource Recovery Exemption to allow the Woodlawn Organic Output to be used for the Rehabilitation Trial. The trial is continuing during care and maintenance of the Woodlawn Mine.

Rehabilitation obligations within the Woodlawn Mine operations area are the responsibility of the mine operator and are defined in the approved Mining Operations Plan (Heron Resources 2015). The approved Mining Operations Plan sets out the rehabilitation objectives and methodologies to achieve the nominated final land use. The approved rehabilitation strategy as described in the Mining Operations Plan involves a mix of agricultural lands, with a land capability suitable for grazing, and areas of native revegetation that are compatible with surrounding vegetation systems.

2.3.2 Waste management

Veolia (then Collex) purchased the Woodlawn property, now the site of the Eco Precinct, in 2001 following the closure of the mining operations. The property was purchased with the intention of establishing a waste management facility, whilst rehabilitating areas disturbed by prior mining operations.

Pylara Farm, adjacent to the mine site was acquired by Veolia to provide a buffer to sensitive receptors while maintaining agricultural activities that incorporate sustainable management practices.

The Eco Precinct, which includes both Woodlawn and Pylara properties, is shown in Figure 2.1.

The Eco Precinct has developed over the last 20 years to become an integrated waste management and resource recovery operation, incorporating the Bioreactor, a landfill facility, the BioEnergy Power Station operating on landfill gas, an MBT facility, a solar farm, and a wind farm operated by Iberdrola. The Bioreactor and Crisps Creek IMF commenced operating in 2004, and the MBT facility commenced operating in 2017. Veolia prides itself on having been a respectful and valuable contributor to the local community for almost 20 years. Community and stakeholder engagement began with Veolia's acquisition of the former mining operations, with the Community Liaison Committee (CLC) established in 2001 for the initial Eco Precinct. Since its inception, the CLC has played an important role in Veolia's community engagement program. Figure 2.5 shows the evolution of the Eco Precinct.

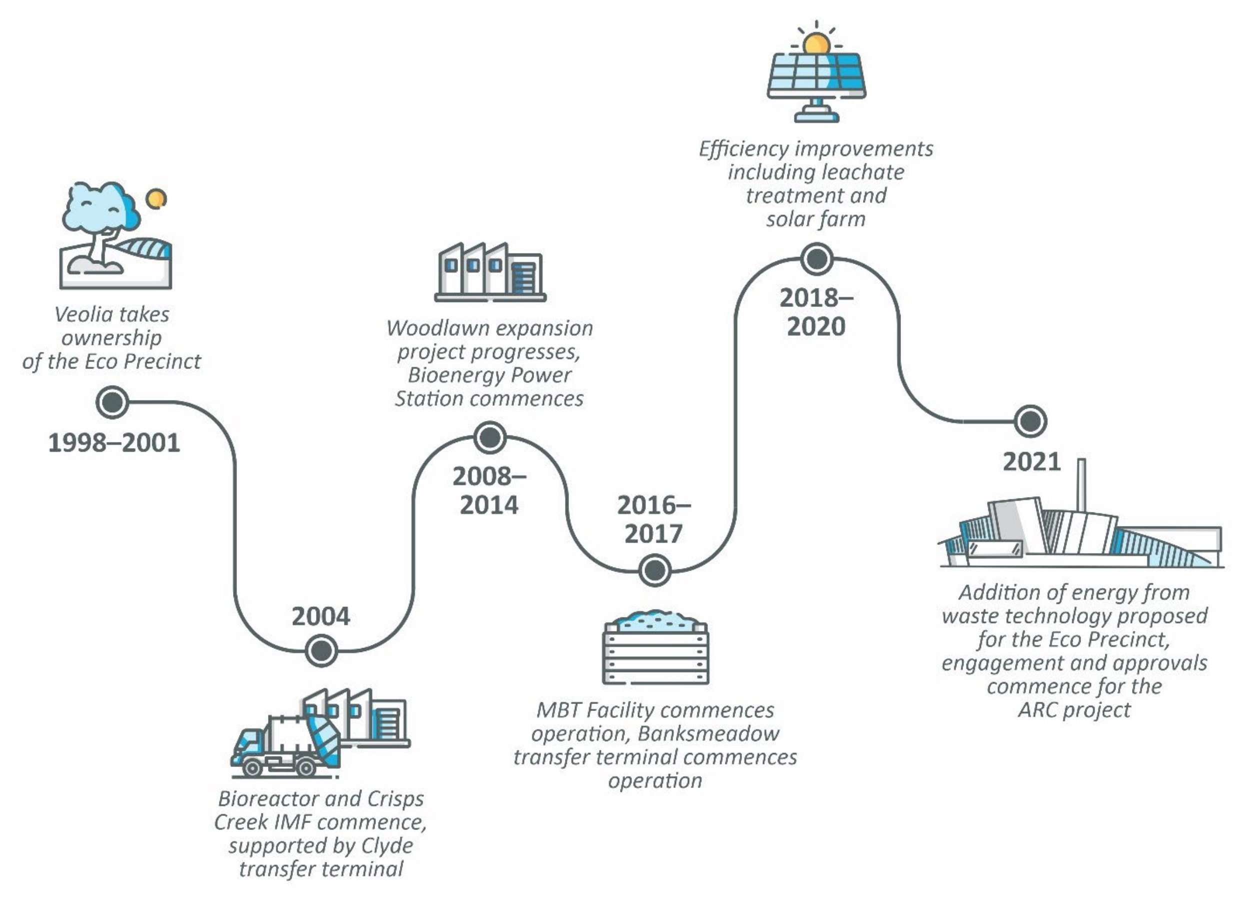


Figure 2.5 Evolution of the Eco Precinct

2.4 Existing approvals

There are three primary approvals relevant to Veolia's integrated waste management operations in the Eco Precinct (refer to Appendix B for copies of existing development consents/approvals):

- DA31-02-99 for the Woodlawn Waste Management Facility approved by the Minister for Urban Affairs and Planning in 2000.
- MP06_0239 for the Woodlawn Alternative Waste Technology Project (now the MBT facility) was approved by the Minister for Planning in 2007.
- MP 10_0012 for the Woodlawn Waste Expansion Project approved by the Planning Assessment Commission in 2012.

Figure 2.6 summarises the approved waste volumes that can be received by the Eco Precinct. The Bioreactor, BioEnergy Power Station, Crisps Creek IMF and MBT Facility are described in further detail in the following sections.

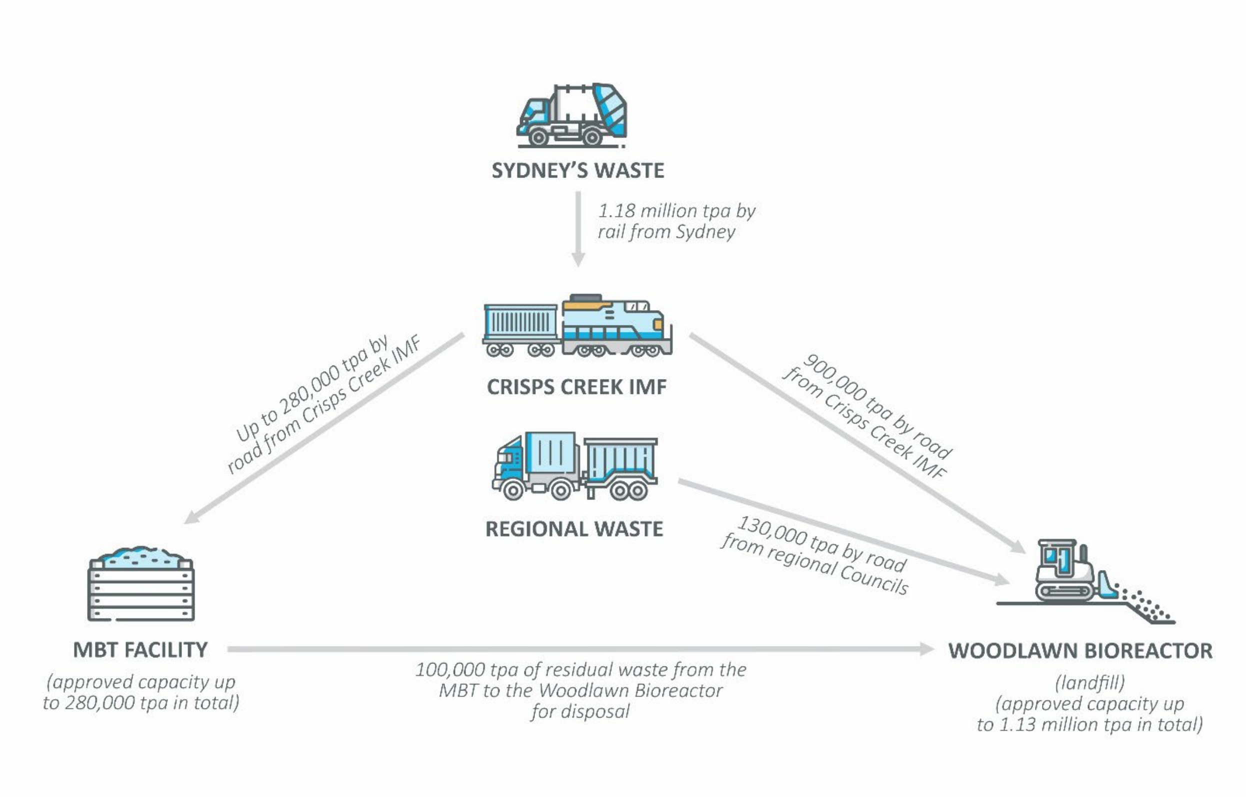


Figure 2.6 Approved waste volumes at the Eco Precinct

Table 2.1 summarises the existing development consents relating to waste management operations at the Eco Precinct. The relationship between the existing development consents and the project is discussed in the following sections.

Table 2.1 Development consents and approvals for integrated waste management operations at the Eco Precinct

Operations	Approval reference and description	Year approved
Woodlawn Waste Management Facility	**DA31-02-99** – the original development consent for waste management operations at the Eco Precinct permitting the development of the Woodlawn Waste Management Facility, including: • the Bioreactor, with an approved input rate of up to 500,000 tpa; • BioEnergy Power Station; and • Crisps Creek IMF.	2000
	DA31-02-99 Mod 1 – receive up to 50,000 tpa of waste by road from the local area.	2010
Woodlawn MBT Facility	**MP06_0239** – the MBT facility (originally known as the Woodlawn Alternative Waste Technology Project) is approved to receive up to 280,000 tpa of mixed waste (240,000 tpa of MSW and 40,000 tpa of garden organics) by rail from the Greater Sydney, utilising the Crisps Creek IMF.	2007
	MP06_0239 Mod 1 – efficiency improvements to the MBT Facility.	2014
	MP06_0239 Mod 2 – processing of residual waste from the MBT process at the solid recovered fuel facility. This facility is approved to process up to 50,000 tpa of residual waste from the MBT, however has not been constructed to date. The solid recovered fuel facility (if constructed) would divert approximately 37,400 tpa MBT residual waste from landfill and produce solid recovered fuel material that will be transport offsite by rail via the Crisps Creek IMF.	2019
Woodlawn Waste Expansion Project	**MP 10_0012** – approval for increased throughput of the Bioreactor and Crisps Creek IMF, including: • increased input rate for the Bioreactor to 1,130,000 tpa; • increased throughput rate of Crisps Creek IMF to 1,180,000 tpa; and • increased local transport by road to 130,000 tpa (with written consent).	2012
	DA31-02-99 Mod 2/ MP 10_0012 Mod 1 – alter site water and leachate management.	2016
	DA31-02-99 Mod-3/ MP 10_0012 Mod 2 – construction of the leachate treatment plant.	2017
	MP 10_0012 Mod 3 – solid recovered fuel facility (consistent with MP06_0239 Mod 2).	2019
	MP 10_0012 Mod 4 – temporary receipt of waste from bushfire impacted areas.	2020

2.4.1 Woodlawn Bioreactor and BioEnergy Power Station

i Approved activities

Approved under the original consent (DA31-02-99) and subsequently modified by MP 10_0012, the Bioreactor was the first stage of the Eco Precinct developed by Veolia. The Bioreactor is located in the former open-cut mine void. The Bioreactor includes a landfill gas collection system. Landfilling operations commenced in September 2004. The Bioreactor is approved to receive up to 1,130,000 tpa of waste for landfilling, comprising up to:

- 900,000 tpa of putrescible and non-putrescible waste received via rail from Sydney;
- 130,000 tpa (with written consent) of putrescible waste received via road from areas regional to the Eco Precinct; and
- 100,000 tpa of residual waste from the MBT facility.

Operations at the Bioreactor are approved 6.00 am to 10.00 pm, Monday to Saturday.

The Bioreactor decomposes putrescible waste more efficiently than traditional landfills through the recirculation of leachate. Waste is deposited in the Bioreactor, with optimal moisture and temperature conditions to achieve enhanced production of landfill gas, which is collected by infrastructure within the void.

In 2008, the first purpose-built landfill gas-fired engines were installed at the BioEnergy Power Station. The methane contained in the landfill gas is used as fuel to generate electricity at the BioEnergy Power Station which is exported to the grid. There are currently seven engines installed on site, although approvals provide for a staged increase in the number of engines installed at the BioEnergy Power Station commensurate with increases in the landfill gas yields. There is a vacant area adjacent to the BioEnergy Power Station reserved for the future development of a second building to house additional gas engines, known as Hub 2. Excess heat from the operation of the BioEnergy Power Station is used for aquaculture and hydroponic horticulture trials at the Eco Precinct.

Key features of the Eco Precinct's existing water management system are approved under DA31-02-99 and MP 10_0012 (as modified), including several runoff capture dams, pumped reticulation systems, a leachate treatment plant and several evaporation dams, notably:

- Evaporation Dam 1 (ED1) system – receives direct rainfall, runoff from the surrounding area, a catchment area to the west of the Bioreactor and water pumped from the Waste Rock Dam and plant collection dam (PCD). Water accumulation is managed via natural and assisted evaporation from ED1.
- Evaporation Dam 3S system – receives direct rainfall, runoff from the surrounding area and runoff captured in the Bioreactor Void. Water accumulation is managed via natural evaporation from ED3S.
- Leachate management system – the leachate treatment plant was approved in late 2017 (DA31-02-99-Mod-3/MP 10_0012 Mod 2) to improve the performance of the Bioreactor. It commenced operating in 2018 and manages leachate that is pumped from the Bioreactor void. The leachate treatment plant facilitates better environmental and operational performance by allowing Veolia to extract and treat greater volumes of leachate from the Bioreactor, minimising the generation of odour, enabling more efficient gas extraction and maximising the waste to energy benefits of the Bioreactor. Six evaporation dams are used to manage the accumulation of treated leachate via natural and assisted evaporation.

The Crisps Creek IMF is approved under consent DA31-02-99 and subsequently modified by MP 10_0012. The IMF is approved to accept 1,180,000 tpa of waste from Greater Sydney for transport to the Eco Precinct. It forms an integral part of the logistical operations of the Eco Precinct. The IMF is approximately 2 km from the village of Tarago (Figure 2.1), adjacent to the Goulburn-Bombala Railway line. Containers with compacted waste, transported from Sydney by rail, are unloaded and transferred onto road trailers at the IMF for transport to the Bioreactor.

Crisps Creek IMF operates Monday to Saturday from 6.00 am to 10.00 pm and receives waste from up to two trains per day. Empty waste containers are temporarily stored at the IMF, except in the case of an emergency, and returned to Sydney by train.

A solid recovered fuel facility is approved under MP 10_0012 (MP 10_0012 Mod 3) and MP 06_0239 (Mod 2). This facility was approved to process up to 50,000 tpa of residual waste from the MBT facility that would otherwise be sent to landfill; however, it has not been constructed to date.

ii Relationship with the project

The project will rely on development consents DA31-02-99 and MP 10_0012 (as modified) to enable:

- transport of waste from Greater Sydney to Crisps Creek IMF and transport to the Eco Precinct;
- use of existing water management infrastructure and water supply;
- use of the internal road network within Veolia's integrated waste operations area; and
- rehabilitation of previously disturbed areas within the development footprint, which will occur prior to construction of the project.

It is noted that the proposed encapsulation cell development footprint is within the overall footprint of evaporation dam ED1. Approval is sought for the construction of project infrastructure within ED1, which will effectively reduce the capacity of ED1 available for water storage. This EIS has considered the impact on the operation of the broader site water management system as a result of this reduction in capacity (refer to Section 8.7) and demonstrates that the existing water management can continue to function effectively.

The solid recovered fuel facility approved under MP 10_0012 (Mod 3) is within the proposed ARC development footprint. Therefore, if the solid recovered fuel facility was to proceed in the future, a further modification of MP 10_0012 would be required to develop the facility at an alternative location. At this stage, it is unlikely that the solid recovered fuel facility will proceed due to uncertainty of the future use of the MBT facility, from which the solid recovered fuel facility would receive residual waste.

2.4.2 Woodlawn MBT facility

The MBT facility (originally known as the Woodlawn Alternative Waste Technology Project) was approved under MP06_0239 in 2007. It is approved to receive up to 280,000 tpa of waste (240,000 tpa of MSW and 40,000 tpa of garden organics). Waste is predominantly transported to the MBT facility within containers from Crisps Creek IMF as part of integrated operations.

Waste is processed at the MBT facility to extract recyclable materials and to produce an organic output from the organic fraction. This material is matured on site. Stage 1 of the MBT commenced operation in 2017 with capacity to process up to 144,000 tpa of MSW and 40,000 tpa of garden organics.

Waste receival, mobile plant and equipment operations at the MBT facility are approved 6.00 am to 10.00 pm, Monday to Saturday. The MBT infrastructure and fermentation/processing activities operate on a continuous basis, 24 hours per day, seven days a week.

i Relationship with the project

The project is not directly related to the development consent for the MBT facility (MP06_0239 as modified).

2.4.3 Other development consents and approvals

Other related development consents and approvals for operations at the Eco Precinct are presented in Table 2.2 below. There are no direct interactions between these existing consents and the project.

Table 2.2 Other related approvals at the Eco Precinct

Operations	Description	Approval reference
Aquaculture and horticulture operations	Veolia uses waste heat from the BioEnergy Power Station's gas-fired engines in aquaculture operations to cultivate fish, with a horticultural system operating to remove excess nutrients. This is in keeping with the objectives of utilising as many resources as possible within the Eco Precinct.	Local Council approval
Woodlawn Wind Farm (the wind farm) operated by Iberdrola	The 48 MW Woodlawn wind farm comprises 23 turbines and is located along a ridgeline running through both the Woodlawn and Pylara properties. This operation commenced in 2011. The Woodlawn Wind Farm is owned and operated by Iberdrola.	DA250-10-2004, approved 2005
Woodlawn Solar Farm	In June 2019, Veolia commissioned a 2.3 MW solar farm adjacent to the MBT Facility. The electricity generated from this solar farm is directly utilised by Veolia's MBT Facility, with excess used by the Bioreactor operations.	Local Council approval
Woodlawn Mine	The Woodlawn Mine is approved to extract up to 1.5 mtpa of copper, lead and zinc ore for up to 21 years (to 2035) from reprocessing existing tailings dams and mining of underground workings within SML20. The Woodlawn Mine includes dewatering the underground mine workings into, and drawing process water from, evaporation dams at the Eco Precinct. The mine infrastructure area and processing plant has been constructed in the area to the east and south-east of the proposed ARC development footprint. Tailings dams are located in the south-east portion of the Eco Precinct. The processing plant includes a crushing plant, water treatment plant, tailing thickeners and a floatation building. Evaporation Dam 2 (ED2) contains water from mining operations. The Woodlawn Mine Project's operations were suspended in early 2020, with the mine and processing plant in care and maintenance.	PA07_0143, approved 2013

2.5 Integrated site rehabilitation and remediation

The Eco Precinct has legacy rehabilitation requirements from mining activities that occurred from 1978 to 1998. Following cessation of mining in 1998, Veolia took over mine rehabilitation obligations within the Eco Precinct, as well as the ongoing monitoring for potential environmental impacts, with the intention of using the site for waste management purposes whilst also rehabilitating areas disturbed by prior mining.

The rehabilitation strategies for the former mine void (now the Bioreactor) and surrounding infrastructure which are part of Veolia's integrated waste management operations, are addressed in Veolia's Landfill Closure and Rehabilitation Management Plan (LCRMP) (Veolia 2016). The LCRMP outlines Veolia's approach to rehabilitate areas that are generally covered under the development consents (DA 31-02-99 and MP 10_0012), and includes the Bioreactor, water management infrastructure (ED1 and the plant collection dam), areas surrounding the administration buildings and other infrastructure. The LCRMP is available on Veolia's website:

https://www.veolia.com/anz/sites/g/files/dvc2011/files/document/2016/10/Landfill_Closure_Rehabilitation_Management_Plan_8_August_2016.pdf

Rehabilitation of other mine-related areas (outside the area to which the LCRMP applies) are a requirement of a separate development consent for Woodlawn Mine (PA07_0143) and are addressed as part of the Woodlawn Mining Operations Plan (MOP) (Heron Resources 2015). The MOP outlines the process and timing for whole of mine rehabilitation for the parts of the Eco Precinct outside Veolia's integrated waste management operations.

The development footprint, including the ARC and encapsulation cell, is within the Veolia's area of integrated waste management operations which is addressed by the LCRMP.

2.6 Other operations that support the Eco Precinct

As described in Section 2.2, and in addition to development consents for existing operations at the Eco Precinct, Veolia's integrated waste management operations also rely on the following development consents which facilitate the transport of waste to the Eco Precinct:

- DA205-08-01 (as modified) for the Clyde Transfer Terminal, approved to receive up to 600,000 tpa of putrescible and non-putrescible waste.
- SSD-5885 (as modified) for the Banksmeadow Transfer Terminal, approved to receive up to 500,000 tpa of putrescible and non-putrescible waste.

Development consents for these operations are held by Veolia but are separate to the Eco Precinct. Waste is unloaded, sorted, compacted and containerised into purpose-built shipping containers at these terminals for transport by rail to the Crisps Creek IMF. Waste from these transfer terminals is transported to either the Bioreactor or the MBT Facility, depending on Veolia's contractual obligations with its customers and determined by the type of waste.

Chapter 3

Strategic context

3 Strategic context

3.1 Strategic justification for the project

3.1.1 Energy from waste

Energy from waste (EfW) is the process of extracting the embedded energy from materials that would otherwise be disposed of in a landfill. Recovering energy from waste can occur in a number of ways, but most often through a process of controlled combustion. In Australia there are a range of smaller scale ERF projects in operation, for example, many sugarcane mills generate electricity utilising the bagasse or waste from the sugarcane milling process to meet their energy requirements.

Energy recovery from residual waste works in a similar way to conventional coal or gas combustion, where steam is generated from heat and directed into a turbine to produce electricity. Instead of using fossil fuels, EfW technology has been adapted and updated to use non-recyclable residual waste materials as the fuel source.

Whilst commercial scale energy recovery technology is relatively new to Australia, it is widely used globally. This was noted in 2019 by the House of Representatives Standing Committee on Industry, Innovation, Science and Resources' inquiry report, *From Rubbish to Resources: Building a Circular Economy* (Commonwealth of Australia 2020). A subsequent report by Infrastructure Partnerships Australia, *Putting Waste to Work: Developing a Role for Energy from Waste*, (Infrastructure Partnerships Australia 2020) identified that in the European Union (EU) alone there are over 450 ERFs in operation where emissions are tightly regulated by the EU Industrial Emissions Directive.

In the EU ERFs are regarded as complementary to a circular economy and an appropriate treatment for residual waste which would otherwise go to landfill. The EU Waste Framework Directive, and NSW legislation and policy recognise ERFs as a legitimate waste recovery process after waste avoidance, reuse and recycling.

Veolia currently operates over 65 ERFs around the world and is bringing this operational expertise to Australia. There are a number of proposals for commercial scale ERFs in NSW and Victoria, and two facilities currently under construction in Western Australia (WA). Once complete the Kwinana EfW project in WA will process up to 400,000 tpa of residual waste from eight local government areas and generate 36 MW of energy for export to the grid. Nearby the East Rockingham Waste to Energy plant is also under construction and will process 300,000 tpa. Veolia will operate and maintain both of these WA facilities when construction is complete.

In NSW, waste management and resource recovery policies provide detailed criteria for any proposed ERFs. These criteria include demonstrating that the proposal represents best practice/best available techniques (BAT) and good neighbour principles.

3.1.2 Commonwealth waste policy and objectives

The *National Waste Policy* (Commonwealth of Australia 2018) (the NW Policy) provides a national framework for waste and resource recovery in Australia. It outlines roles and responsibilities for collective action by businesses, governments, communities and individuals.

The NW Policy is based on the circular economy, which aims to:

> retain the value of materials in the economy for as long as possible, reducing the unsustainable depletion of natural resources and impacts on the environment. A circular economy has economic benefits, creating new industries, markets and products, and leading to new revenue streams (p.11)

The NW Policy has five underlying principles:

1. Avoid waste.
2. Improve resource recovery.
3. Increase use of recycled materials.
4. Better management of material flows.
5. Improve information to support policy making.

The NW Policy reinforces the waste hierarchy (shown in Figure 3.1) which recognises that energy recovery is a preferrable method of waste management to disposal in a landfill.

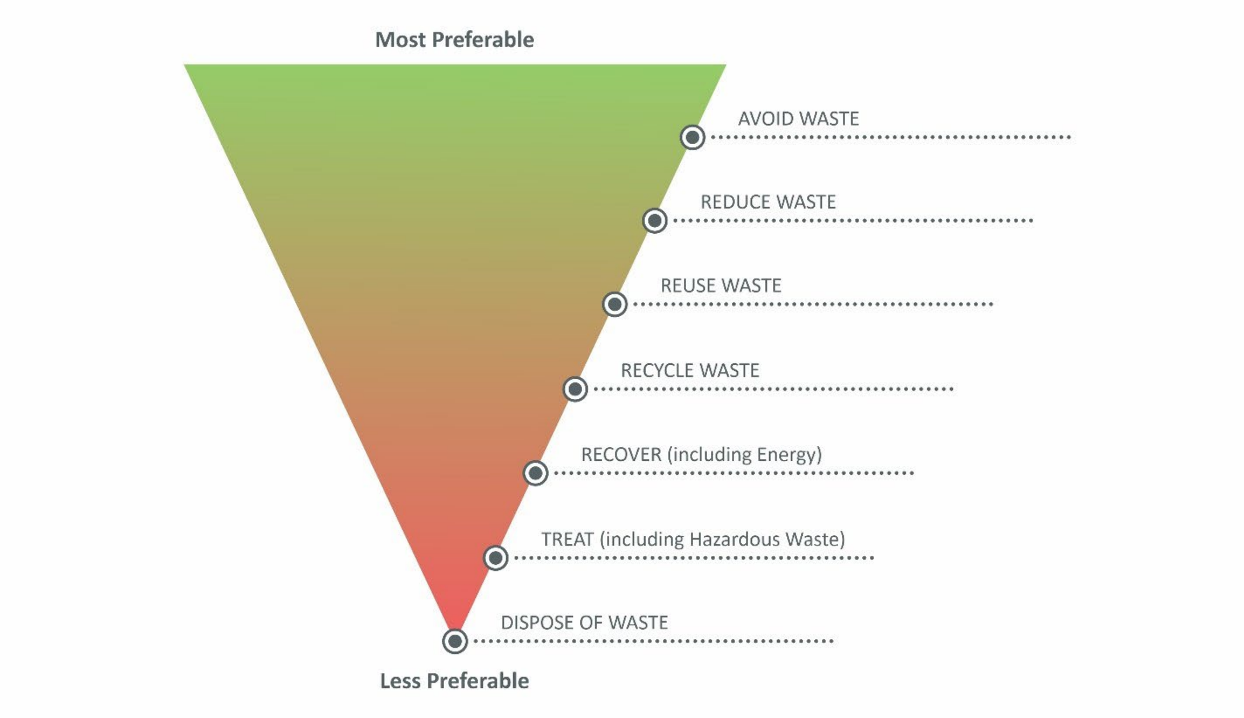


Figure 3.1 The waste hierarchy from the NW Policy (Commonwealth of Australia 2018)

A key objective of the NW Policy is to increase the recovery rate, or in this case the proportion of waste that is recycled or subject to energy recovery. The NW Policy includes:

> Strategy 7 Increasing industry capacity
>
> Identify and address opportunities across municipal solid waste, commercial and industrial waste, and construction and demolition waste streams for improved collection, recycling and energy recovery, to deliver ongoing improvements in diversion from landfill, improved quality of recycled content and use of the waste hierarchy.

Hence, the NW Policy supports the development of the energy recovery industry nationally.

3.1.3 NSW waste legislation and policy

Waste management in NSW is governed by legislation including the *Waste Avoidance Resource and Recovery Act 2001* (WARR Act) and the *Protection of the Environment Operations Act 1997* (POEO Act).

The WARR Act promotes waste avoidance and resource recovery with the objective of minimising waste generation and disposal, and sets out objectives to ensure that resource management considers the following hierarchy:

1. avoid unnecessary resource consumption;
2. resource recovery (reuse, reprocessing, recycling, energy recovery); and
3. disposal.

Where the generation of waste cannot be avoided, or products cannot be reused, recovery technologies can provide a solution to maximise resource efficiencies and improve sustainability. The diversion of waste from landfills is a key objective of the WARR Act.

The POEO Act provides for environmental protection and management and provides an overarching framework to ensure the protection of human health and the environment from the inappropriate use of waste.

A range of regulations and policies support the waste management objectives of the NSW Government. These make it clear that the reduction of waste going to landfill is a key policy objective and that EfW is an accepted technology to assist in achieving landfill diversion targets. The most relevant policies and strategies are addressed below.

i Waste and Sustainable Materials Strategy 2041

In June 2021, the NSW Department of Planning and Environment (DPE) released the *Waste and Sustainable Materials Strategy 2041 (Stage 1: 2021–2027)* (DPIE 2021a) (the WASMS) and separate NSW Plastics Action Plan (DPIE 2021d).

The WASMS replaced the previous *Waste Avoidance and Resource Recovery Strategy 2014–2021* and established new state-wide actions and targets. The key target is to achieve an average recycling rate of 80% (all streams) by 2030, which is an increase from the 65% achieved in 2018/19.

A key target of the WASMS is to develop at least one large scale regional ERF in proximity to Greater Sydney by 2030.

Other key targets in the WASMS with potential to materially impact residual putrescible waste volumes and/or composition are:

- Reduce total waste generated by 10% per person by 2030.
- Have an 80% average recovery rate from all waste streams by 2030.
- Significantly increase the use of recycled content by governments and industry.
- Phase out problematic and unnecessary plastics by 2025[1].
- Halve the amount of organic waste sent to landfill by 2030.

The WASMS is built around three ‘focus areas’, the following two of which are directly relevant to the project.

[1] It is not known how this phase out will occur, including any balance between ‘avoidance’ and ‘substitution’ with non-problematic alternatives. This target has not been included in modelling as it is of low materiality to overall residual waste volumes.

a Meeting our future infrastructure and service needs

Under this focus area the NSW Government will "strategically plan for critical waste infrastructure, working closely with local governments and industry, with a focus on co-locating businesses in precincts that support circular economy and clean technology activities" (p.19). The WASMS identifies that the Government's "highest priority is to extend the life of our current landfills by reducing the volumes of waste we must manage, either through avoidance or recycling" (p.20).

The WASMS addresses the role of energy from waste and notes that:

> recovering energy from waste can be a legitimate and necessary residual waste management option where it can deliver positive outcomes for the community and the environment and assist in lowering our carbon footprint and reducing the need for landfill. Energy recovery can reduce emissions by replacing more carbon-intensive fuels and by stopping harmful methane emissions from materials in landfill (p.22).

With reference to ERFs, the strategy indicates that Greater Sydney will require:

- by 2030 – at least one large scale regional ERF; and
- by 2040 – at least three more large scale ERFs.

The project will address the 'meeting our future infrastructure and service needs' WASMS focus area as it will provide an ERF option for Sydney that will preserve landfill space and that will utilise and be supported by existing integrated waste management infrastructure on land that has appropriate land use zoning.

b Reducing carbon emissions through better waste and materials management

Under this focus area, the WASMS notes that a transition to a circular economy means increased resource efficiency, including by making materials "more productive by recycling, remanufacturing or extracting their embodied energy" (p.18), supporting the development of appropriately planned and managed ERFs. The WASMS circular economy concept is presented in Figure 3.2. The circular economy concept is also embedded in the NSW Government's *NSW Circular Economy Policy Statement – Too Good To Waste* (EPA 2019).

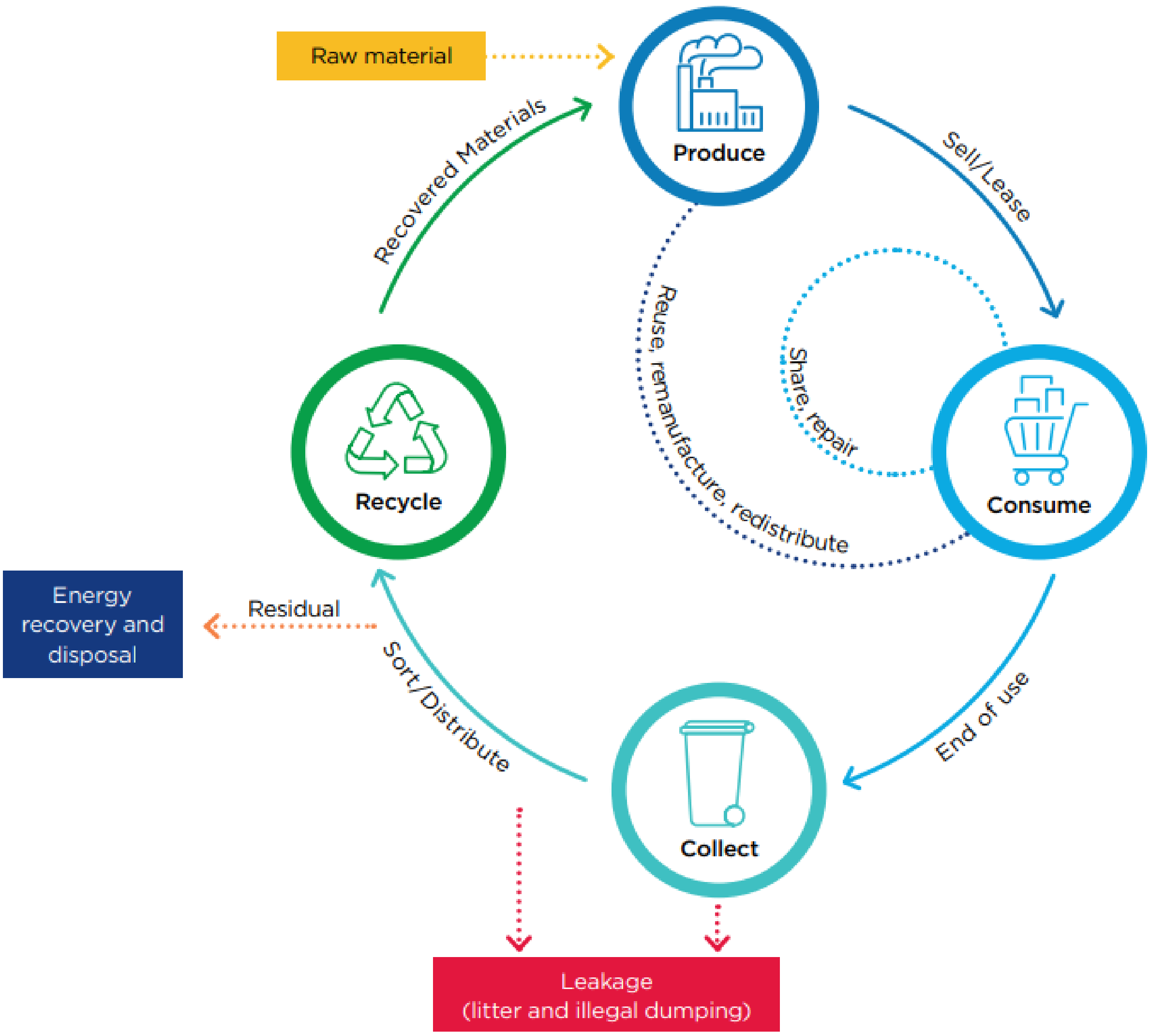


Figure 3.2 Circular economy from WASMS (DPIE 2021a)

ii NSW Energy from Waste Policy Statement

The EfW Policy Statement was revised in 2021 to align with the WASMS and is a key guidance document for ERF proposals in NSW. It sets out a series of criteria to be met by EfW projects, covering:

- technical issues;
- resource recovery;
- thermal efficiency;
- best practice/BAT; and
- the good neighbour principle.

The 2021 revision includes a set of emission standards and monitoring requirements which were developed following an enquiry by the NSW Chief Scientist, as documented in the *Energy from Waste: Report the NSW Chief Scientist and Engineer* (CSE 2020).

The EfW Policy Statement sets out the opportunities of thermal treatment of waste as being:

1. the recovery of embodied energy from waste;
2. offset of non-renewable energy sources; and
3. avoidance of methane emissions from landfill.

The EfW Policy Statement notes that achieving these outcomes is contingent on both ensuring efficient use of resources, with no increase in the risk of harm to human health or the environment.

Under the EfW Policy Statement, the project is defined as an ‘energy recovery facility’ which falls outside the ‘eligible waste fuels’ category and is therefore expected to meet the criteria set out in Section 4 of the EfW Policy Statement. The EfW Policy Statement requires that facilities proposing to recover energy from waste need to meet current international best practice techniques to ensure emissions are below levels that pose a risk to the community. In particular, this is to be achieved through:

- process design and control;
- emission control equipment design and control; and
- emission monitoring with real-time feedback to the controls of the process.

The revised EfW Policy Statement includes a set of emission standards for ERFs which are regarded as the most stringent in the world.

The EfW Policy Statement is supported by the *Guide to the NSW Energy from Waste Framework* (EPA 2021c) (EfW Framework).

Compliance with the EfW Policy Statement is addressed throughout this EIS and is summarised in Chapter 6.

iii Energy from Waste Infrastructure Plan

In September 2021, the NSW Government released the *Energy from Waste Infrastructure Plan* (EPA 2021b) (EfW Infrastructure Plan) to support the WASMS. It “guides strategic planning for future thermal energy from waste facilities to ensure infrastructure is located in areas that best address the state’s waste management needs until 2041” (p.2).

The EfW Infrastructure Plan identified four specific EfW Priority Infrastructure Areas, one of which is the Southern Goulburn Mulwaree Precinct. The boundaries of this precinct include the Eco Precinct, and hence this project is located in one of the NSW Government’s identified priority locations. Therefore, this proposal is compliant with EfW Infrastructure Plan.

iv Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022

The Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022 (the Thermal EfW Regulation) commenced on 8 July 2022. The Thermal EfW Regulation legislates the EfW Infrastructure Plan. It prohibits the thermal treatment of waste for energy recovery, unless it is undertaken in a nominated precinct as defined in clause 128C of the Thermal EfW Regulation.

Clause 128C identifies the Southern Goulburn Mulwaree Precinct as a nominated precinct. The Eco Precinct and ARC are located within the Southern Goulburn Mulwaree Precinct and are therefore not prohibited under the Thermal EfW Regulation.

3.1.4 Need for the project

A range of studies have identified the need for additional waste management and disposal infrastructure to serve the Sydney basin. In particular, the current available putrescible waste landfills in Sydney are forecast to be at capacity within 15 years (DPIE 2021a). Therefore, preserving available airspace at approved landfills can delay the need for additional facilities.

Recent NSW government policy documents supporting the need for additional waste infrastructure include:

- Cleaning Up Our Act: Redirecting the Future for Waste and Resource Recovery in NSW: Issues Paper (DPIE 2020) – which states that "additional waste and resource capacity is needed". It also noted that it can take many years for the planning and approval processes for waste infrastructure and:

  "therefore, it is critical to plan and prepare early for all types of waste and resource recovery infrastructure including*:*

  …….

  energy from waste facilities to provide an option for treating residual waste

  landfill capacity to address residual waste where there are no economically feasible alternatives" (p.32)

- WASMS 2041 – as noted above, this suggests that Greater Sydney needs at least one ERF by 2030 and potentially three more by 2040.

- EfW Infrastructure Plan – this reinforces the conclusions of the WASMS and identifies priority sites for ERF developments, including an area which includes the Eco Precinct. The Thermal EfW Regulation legislates the EfW Infrastructure Plan.

The ARC would contribute to meeting the identified demand for additional waste processing infrastructure for Sydney.

There have been a range of ERF projects proposed to serve Greater Sydney in recent years, however the ARC project has numerous advantages including:

- it is sited within a designated EfW Priority Infrastructure Area in regional NSW;
- it would be located within a compatible and appropriately zoned site, which has hosted integrated waste management operations for the last 20 years, so would utilise existing site infrastructure including the Bioreactor landfill, water management system, and site administration facilities;
- there is an existing residual waste feedstock stream to the Eco Precinct which can be diverted to the ERF;
- there is no need for transportation of additional feedstock beyond that which is already approved, and would utilise the existing network of waste by rail infrastructure from Sydney through the Clyde and Banksmeadow Transfer Terminals and the Crisps Creek Intermodal Facility;
- the project would be owned and operated by Veolia, who are experienced ERF operators globally; and
- there is a buffer of about 4 km to the nearest private residence.

3.1.5 Conclusion

In conclusion, the NSW Government policy:

- establishes the need for at least one ERF to serve Sydney by 2030 and for three more by 2040; and
- identifies the Eco Precinct as an EfW Priority Infrastructure Area which is appropriate for this form of development, provided it complies with the EfW Policy Statement and best practice design operation and environmental management.

3.2 Regional strategic planning

The strategic land use planning documents relevant to the further development of the Eco Precinct are described below.

i Local strategic planning statement

Adopted in August 2020, the Goulburn Mulwaree Local Strategic Planning Statement (Planning Statement) provides a 20-year vision for the future growth within the Goulburn Mulwaree LGA.

The Planning Statement identifies ten planning priorities for land use planning in the LGA over the next 20 years. A number of these are relevant to this proposal, and these are discussed below.

Planning Priority 5: Primary Industry

This planning priority provides acknowledgement that renewable energy infrastructure is important to the local and regional economy, however, should not be at the expense of crop and pasture potential.

Further, planning principles should be identified to support primary industry within the region including adequate protections for primary industry activities while also balancing the interests of the community and the promotion of renewable energy projects.

This project does not compromise the use of any agricultural land. Furthermore, the Human Health Risk Assessment (HHRA) (refer to Section 8.2 and Appendix P) has assessed impacts to agricultural land uses, including the assessment of risks arising from exposures to, among other receivers, crops and water sources surrounding the project, and found that maximum predicted concentrations of pollutants would be well below limits prescribed in relevant food standards (refer to Appendix P). The project therefore complies with this priority.

Planning Priority 6: Industry and Economy

It is identified in Planning Priority 6 that the majority of residents are also employed within the LGA. It indicates the important planning priorities that provide continued support to regional growth sectors noting that "opportunities to attract employment generating business need to be maximised" (p32).

Development of the ARC provides regional employment opportunities in both the construction and operational phases of the project.

Planning Priority 7: Sustainability

As a growth area the Goulburn Mulwaree Council has identified the need to provide waste and recycling services and infrastructure to meet the needs of the growing community in a way that achieves environmental and sustainability improvements to the region. Challenges noted include:

- supporting increased take up of renewable energy generation and use; and
- provision of waste management facilities that supports a circular economy with local reuse and recycling options (p.36).

The project will enhance the region's ability to implement circular economy waste management principles and benefit from energy produced locally.

ii South East and Tablelands Regional Plan 2036

The *South East and Tablelands Regional Plan 2036* (Regional Plan) provides a blueprint for regional growth balanced with protection of the natural environment. The Regional Plan was developed to provide an overarching framework to guide more detailed NSW government policies for regional land use planning and inform infrastructure funding decisions.

The Regional Plan is made up of five goals, each of which is supported by a series of directions and actions as to how regional and local planning can achieve these goals.

The following goal and associated direction are considered to have relevance to the project:

Goal 1: A connected and prosperous economy

Diversification of priority growth sectors in the South East and Tablelands is identified as part of this goal and includes sectors such as agriculture and aquaculture, freight and logistic, and renewable energy. All of these sectors are currently being undertaken as components of the Eco Precinct and will benefit as a result of the project. In future the project may also be able to supply IBAA as construction material, providing further integration and connection within the economy.

Direction 6: Position the region as a hub of renewable energy excellence

This direction is supported by a number of relevant actions, including the following

- Action 6.1 Identify opportunities for renewable energy industries.
- Action 6.3 Encourage the co-location of renewable energy projects to maximise infrastructure, including corridors with access the electricity network.
- Action 6.4 Promote best practice community engagement and maximise community benefits from renewable energy projects.

iii Tablelands Regional Community Strategic Plan 2016–2036

The *Tablelands Regional Community Strategic Plan 2016–2036* (Strategic Plan) was developed as a requirement of the NSW Government's Integrated Planning and Reporting Framework. It provides the opportunity for local government to engage with communities to determine and plan community aspirations for their regions.

This Strategic Plan was developed jointly by the Goulburn Mulwaree Council, Upper Lachlan Shire Council and Yass Valley Council to recognise the synergies and efficiencies of developing a joint regional strategic plan. From the consultation, process five community goals were identified in response to the strategic pillars developed for the Strategic Plan. Of these, the following strategies have been identified as relevant to the project:

Our Environment Strategy EN2: Adopt environmental and sustainability practices

This strategy involves the Councils taking a leadership role in sustainability, adopting sustainability in their own activities, educating their communities, and promoting sustainability with commercial and industrial operators.

Development of the project will provide the region with an innovative sustainability project, equipped with visitor facilities. It can support the objectives of the Council in leading in sustainability.

Our Environment Strategy EN4: **Maintain a balance between growth, development and environmental protection through sensible planning.**

This strategy involves the Councils making good decisions, to encourage business growth whilst protecting the environment through good planning. It notes:

- To make high-impact planning decisions consistent with the planning scheme, to consider social and environmental impacts and community sentiment.

- Investigate incentives for business to establish in the region, but at the same time support approval conditions that encourage positive social and environmental contributions from developers.

This project has been proposed for a site which appropriately zoned, and where it is collocated with other waste management operations. It is also a site that has been identified by state government as a priority area for the development of EfW facilities (see Section 3.1.3).

Veolia recognises the need to ensure the environment is protected through appropriate conditions and to work closely with the community as discussed further in Chapter 7 and Section 8.14.

Our Environment Strategy: EN5 To investigate and implement approaches to reduce our carbon footprint

This strategy contains a number of actions for the Councils, including to "Support the development of renewable energy facilities where appropriate in the region".

The project will provide a 183% emissions reduction (GHG-total) and a saving of 395,034 tonnes of CO_2 eq associated with a waste-based power generation system compared to a coal-based power generation system (refer to Section 8.3 and Appendix R).

Our Economy: Strategy EC5: Encourage collaboration between businesses, government, and training providers to develop employment and training opportunities for young people in the region.

Collaboration between business and government is envisaged to provide educational, training, and employment opportunities within the region.

The project will provide employment opportunities for the region in both established and emerging technologies. Development of the ARC provides employment opportunities in both construction and operational phases of work.

Our Community Strategy CO5: Maintain our rural lifestyle

This strategy aims to have the Councils make decisions that protect the rural and village lifestyles and to build and retain a strong sense of community.

Veolia recognises this objective. This development utilises a site formerly used for minerals processing that is not available for rural purposes. Potential impacts to adjoining and nearby rural uses have been assessed in this EIS; the EIS demonstrates that impacts from the project will not significantly impact rural and village lifestyles surrounding the project. Over the years Veolia has sought to support the local communities, notably Tarago, through the Veolia Mulwaree Trust and participation in the local community.

Our Infrastructure: Strategy IN6: Implement safe, accessible, and efficient management and recycling options for general waste, green waste, and sewage

Under this strategy the Councils state they are seeking a "reduction in waste going to landfill".

As this is the purpose of the project, it will support this strategy.

iv Conclusion

From the preceding sections it can be seen that this project is generally supportive of the regional strategic plans. It provides benefits to total GHG emissions due generation of electricity from a waste-based power generation system (compared to coal, natural gas and biomass-based systems), uses appropriately zoned land, maintains environmental values, rural uses and lifestyles, supports the renewable energy industry, and provides additional employment opportunities within the region.

3.3 Site suitability

The Eco Precinct is a suitable site for the project for the following key reasons:

- compatibility with existing land uses and land use zoning – the development footprint comprises disturbed land that can be remediated and transformed into a productive and complimentary land use at the Eco Precinct;
- approved source of residual waste feedstock – the project will utilise the existing approved infrastructure and processes for transport and management of residual waste feedstock to supply the ARC;
- the ability to utilise existing infrastructure – the project will benefit from the existing transport, water management, waste management and environmental management infrastructure, systems, procedures and practices in operation at the Eco Precinct;
- the Eco Precinct, at 6,000 ha includes a substantial buffer around the operational areas (300 ha), such that the nearest private residence is 4.1 km to the south-west of the project (Figure 2.4); and
- the Eco Precinct is within the Southern Goulburn Mulwaree Precinct, identified in the NSW Government's EfW Infrastructure Plan as one of four priority infrastructure areas to deliver EfW infrastructure in NSW.

The EfW Infrastructure Plan selected sites against a set of criteria, including the following:

- close to existing or planned infrastructure;
- away from high density residential areas;
- connected to existing or planned road or ail infrastructure;
- compatible with environmental and climatic factors (air quality);
- create jobs;
- support secure and sustainable energy in locations that need it;
- attract investment and economic opportunities to communities who need it; and
- support existing waste, net zero and regional growth strategies.

The Eco Precinct is appropriately zoned and has substantial infrastructure developed for integrated waste management and resource recovery. Sustainable and innovative waste management practices have been prioritised at the Eco Precinct for the last 20 years and include a range of complementary waste management and resource recovery operations and technologies, as outlined in Section 2.3. The project is a compatible extension of the existing operations at the Eco Precinct, involving the addition of a waste recovery technology in line with existing sustainable and innovative waste management practices.

The Eco Precinct currently receives waste for recovery, reuse and recycling purposes. Existing infrastructure, including the Banksmeadow and Clyde transfer terminals and Crisps Creek IMF already transport waste by rail to the Eco Precinct from Greater Sydney.

The Eco Precinct already incorporates renewable energy facilities (Woodlawn BioEnergy Power Station, Woodlawn Windfarm and Woodlawn Solar Farm).

In addition, the Eco Precinct and its buffer lands (approximately 6,000 ha) are owned and operated by Veolia who has global expertise in the development and operation of EfW facilities.

As noted above, the project generally complies with and supports the regional and local strategic planning strategies which apply.

On the basis of these factors the development footprint is considered an ideal location for an EfW facility to serve the Sydney region.

3.4 Cumulative impacts with other development

Development both within, and in the vicinity of the Eco Precinct, has the potential to generate cumulative impacts with the project. An assessment has been completed with reference to the DPIE's *Cumulative Impact Assessment Guidelines* (DPIE 2021e). Cumulative impacts are discussed further in Section 9.7.

3.5 Feasible alternatives to the project

A range of alternatives were considered during the development of the reference design, presented in Chapter 4. Alternatives considered included:

- site selection;
- site layout;
- building architecture and design;
- EfW technology;
- air pollution control; and
- management of by-products.

The following sections describe these alternatives. First, the 'do-nothing scenario' is described.

3.5.1 Do-nothing scenario

Should this project not proceed, the feedstock destined for the ARC would continue to be disposed to landfill. This represents a lost opportunity to:

- address a key target of the WASMS to develop at least one large scale regional energy recovery facility in proximity to Greater Sydney by 2030;
- utilise one of the four specific areas identified in the EfW Infrastructure Plan as an EfW Infrastructure Priority Area, and the only one that has an approved and developed logistics network for the delivery of residual waste from Greater Sydney;
- assist the State in achieving the key WASMS target of an average recovery rate of 80% (all streams) by 2030 (refer to Chapter 6 for further discussion);

- generate a low carbon electricity supply from residual waste feedstock in accordance with the waste hierarchy and circular economy; and
- preserve landfill space serving Greater Sydney, which is becoming a scarce commodity, particularly for putrescible waste (refer to Chapter 6 for further discussion).

3.5.2 Siting and layout

A number of different sites within the Eco Precinct were considered for the location of the ARC and supporting infrastructure.

One alternate site was considered, adjacent to the MBT facility. A comparative air quality assessment was carried out and the sites were compared on a range of criteria. The project location was selected because:

- air quality impacts were comparable to the alternative;
- it minimised the trucking distance for the waste and was therefore more energy efficient;
- it was impacted by historic mining uses and provided a suitable long-term land use for these areas, facilitating rehabilitation objectives to be met;
- it has fewer interactions and impacts on other operational aspects of the Eco Precinct; and
- the proposed development footprint was lower in elevation and likely to have fewer visual impacts.

Once the preferred development footprint was identified, the layout of the ARC building and access road network was optimised to utilise the previously disturbed land, minimising impacts on vegetation. The original layout of the ARC would have impacted some remnant stands of vegetation and landscaping. Ecological surveys identified areas for avoidance to reduce overall impacts to native vegetation and habitat and the site layout was modified accordingly, including relocation of the ARC access road.

Similarly, a number of options within the Eco Precinct were considered for the location of the encapsulation cell. These focussed on disturbed areas within Veolia’s area of integrated waste operations. The selected site is within the footprint of an existing evaporation dam, known as ED1. This avoids impacts to undisturbed areas, minimising the environmental impacts of this element of the project.

3.5.3 Architectural design

Veolia’s vision for the project is to deliver a world class ERF to complement the waste disposal management and existing renewable energy infrastructure located at the Woodlawn Eco Precinct. The ARC will be a critical piece of residual waste infrastructure to support the extended the life of current landfills and transition towards a circular economy, achieving better resource recovery outcomes by moving up the waste hierarchy from disposal to energy recovery.

Veolia recognised early on the importance of the visual elements of the project, and has collaborated with leading architects globally to ensure this has been prioritised. Veolia engaged NSW architectural firm Nettletontribe, in collaboration with French architectural firm S’pace to design the ARC as a state of the art facility, with features that draw inspiration from the surrounding natural environment, rural farmland, mining, and the waste management context in which it sits.

The design process has considered a range of designs, materials and colour palettes for the built form, described and presented in detail in the design report in Appendix C. The key features of the layout of the ARC building have been designed and orientated to act as a visual anchor point to the existing ridgeline located to the south of the ARC building. Conceptually, the form and external appearance of the proposed building draws inspiration from the surrounding hillside. Elements such as the undulating topography, the layers in the earth, and the organic form of the local vegetation and natural landscape are celebrated in the built form.

Consideration of alternative material selections have drawn on influences from Veolia's commitment to sustainable methods of processing waste and generating electricity, which is evident throughout the Woodlawn Eco Precinct. A range of material finishes and colour palettes have been considered in Appendix C, with a natural palette of colours selected for the façade to integrate the building with elements of the natural environment in the vicinity of the project.

A key factor in the design of the ARC building has been the context from which the facility will be viewed from Collector Road. The preferred design, when viewed from Collector Road, has been selected for its features which are designed to sit gently within its setting. With a strong focus on the environmental enhancement, the landscape design will seek to enhance local vegetation species and integrate with remnant vegetation and existing landscaping.

3.5.4 Energy recovery technology

There are a number of different technologies that exist for the combustion of municipal waste derived fuels. In general, the proven technologies can be grouped into four main categories as follows;

- Moving Grate.
- Fluidised Bed.
- Gasification.
- Pyrolysis.

The EfW Policy Statement criterion is that proposals should use "proven well understood technology" and "current international best practice techniques". An assessment of the project against the guidance on Best Available Techniques (BAT) from the EU (BREF 2019) is contained in the BAT Assessment (Appendix L(i)). That assessment concludes that "it is clear that the most proven, and hence BAT, for the treatment of municipal waste derived fuels is the moving grate combustion system. When fitted with an advanced combustion control system it is able to achieve good burn out of combustion products and produce bottom ash that is low in total organic carbon (TOC). Secondary flue gas treatment systems are still required for the control of oxides of nitrogen as would be standard across the technology selection" (Appendix L p.10).

3.5.5 Flue gas treatment technology

There are also a range of options and variations available for the flue gas treatment (FGT) systems and their components.

i Adsorption System

The adsorption part of the FGT system is used to control;

- particulate matter or dust;
- acidic gases (Hydrogen chloride (HCl), Hydrogen fluoride (HF) and Sulphur dioxide (SO_2));
- heavy metals (mainly adsorbed on the surface of fly ash particles); and
- dioxins (highly toxic molecules produced in very small amounts during part of the combustion process, adsorbed by activated carbon reagent).

The options are generally categorised as follows:

- 'Dry' systems: the chlorine and sulphur content of the waste leaves the facility as a dry product, and no wastewater is produced. This system is commonly employed in EfW plants. Lime (in various forms) is the most commonly used reagent in a dry system, sodium bicarbonate-based systems are also specified where there is a market that is able to supply and recover the reagent. Another differentiator between lime and sodium bicarbonate is the need to remove the fly ash from the system before the introduction of the reagent, to avoid contamination. The bicarbonate based system requires a higher temperature reaction zone and therefore means that the overall process efficiency can be lower than the equivalent lime system due to an increased stack loss. A bag house filter is used to capture residues for disposal.
- 'Semi-dry' systems: hydrated lime and water are added to the gas stream, with the moisture evaporating to leave dry products, and no wastewater is produced. The reagents may be recirculated to reduce reagent consumption. A bag house filter is used to capture residues for disposal.
- 'Wet' scrubbing systems: these have several processing stages. The basic principle of wet collectors is to wet the contaminant particles in order to remove them from the gas stream. The system design should also include a suitable method to prevent water carryover in the cleaned exhaust gas. Wet scrubbers often convert an air pollution problem into a water pollution problem as a residual wastewater solution is produced that requires further treatment prior to any discharge. For example, a wet scrubber will produce a calcium chloride solution containing the majority of the chloride released from the combusted waste, thereby limiting the generation of solid residues. In addition, wet scrubbers result in a humid exhaust gas which can reduce plume buoyancy and affect ground-level concentrations.

ii Control of NOx

The two key alternatives for NOx control are;

- Selective Non-Catalytic Reduction (SNCR); and
- Selective Catalytic Reduction (SCR)

The SNCR process entails ammonia water, or urea, injection in the upper part of the combustion chamber of the furnace where gases are at a temperature of 850–950°C. These temperatures are suitable for ammonia to react with nitrogen oxide (NO) and nitrous oxide (NO2). Optimisation of the process requires careful control of ammonia injection, flow rates and stable combustion control. Depending on the level of optimisation, the process causes some un-reacted ammonia to leave the boiler with the flue gas. This is known as ammonia slip.

In both dry and semi-dry FGT-systems, a certain amount of the ammonia slip is caught by the residue in the bag house filter. The remaining ammonia leaves the plant with the clean flue gas. A typical requirement for the maximum ammonia slip would be 5–10 mg/Nm^3, though the slip is indicated as a limit value in the EU Directive. Within the NSW Policy, the limit value over 24 hours is 5 mg/m^3; whilst this is a significant reduction, the improvements over recent years in secondary air and combustion control have delivered reductions in original NOx levels and therefore keep the reagents to lower levels, reducing the potential for ammonia slip.

Selective Catalytic Reduction (SCR) is an alternative process to manage NOx levels, although it is typically not required in an EfW facility. The BAT report at Appendix L notes that SNCR is the most commonly used system and that with improvements in combustion control systems and the adoption of multi-level injection of reagents, SNCR is able to achieve the levels of NOx emissions specified in the IED. It concludes "that SNCR with the advanced control and monitoring systems utilised, is the appropriate selection of technology to manage NOx and ammonia slip levels within the upper limit of the IED and NSW EfW policy requirements" (p.12).

iii Conclusion

The selected system involving a semi dry process using SNCR is confirmed as BAT in Appendix L. It is noted that the plant's distributed control system (DCS) will optimise the FGT in real time in a number of ways, including monitoring raw flue gas and temperatures, adjusting the dosing of reagents and monitoring filter bag pressures and stack conditions.

3.5.6 Management of by-products

The management of by-products from the ARC is a key consideration for project design. This issue is detailed in Appendix E. Consideration was given to both on-site and off-site options for management of these by-products as is discussed in the following sections.

i IBA management

IBA generated by the ARC will be managed using proven technologies and methods that are used at a range of reference plants operated by Veolia and others globally. A detailed description of the proposed management of IBA, and its maturation to IBA aggregate (IBAA), is provided in Section 4.4.2 and Appendix E.

The key alternatives considered for the final IBAA product include:

- disposal to landfill as waste;
- use as a rehabilitation material at Eco Precinct;
- use as daily cover for the Bioreactor and encapsulation cell; and
- beneficial reuse as an aggregate material in the construction industry.

None of these options have been discarded. Veolia's objective is to achieve reuse of the IBAA in the construction sector but recognises that this may take time to allow for:

- research to demonstrate feasibility;
- the development of a market which does not yet exist in Australia; and
- to achieve the required approvals from the EPA.

The proposal is to dispose of the IBAA in the Bioreactor in the short term whilst monitoring the characteristics of the IBAA, then to demonstrate and seek approval for its use as a rehabilitation material and daily cover and finally to achieve approval for beneficial reuse.

Options to maximise the beneficial re-use of IBAA from the ARC are fully discussed in Appendix E.

ii APCr management

The APCr will require stabilisation prior to disposal as restricted solid waste. The requirement for this treatment is fully described in Appendix E. A range of treatment options were considered to achieve this stabilisation. The options were assessed against the following factors:

- local availability of treatment material;
- mature technology likely to gain regulatory approval;
- availability of sufficient energy at affordable cost;
- final destination and subsequent required leachability values for the stabilised APCr; and
- creation of unwanted by-products/waste.

A summary of potential APCr treatment methodologies and consideration of their suitability is provided in Table 3.1.

Table 3.1 APCr treatment options

Technology	Specific process	Suitability
Waste Acid Treatment		Process used by several companies in the UK. Unlikely to be possible in Australia due to need for specific industrial waste acids.
Washing	Washing with water	No current use in Australia but a mature technology used throughout Europe and UK.
	Washing with magnesium sulphate ($MgSO_4$)	No current use in Australia and process is at research stage only.
	Acid leaching with nitric acid (HNO_3)	Use of this process is limited worldwide and predominantly in the UK. Not currently used in Australia and would depend on availability of nitric acid.
Chemical Stabilisation	Phosphate injection	Used in EfW plants in North America and Japan. Has been used in Australia for stabilisation of lead in contaminated soils.
	Ferrox	Limited availability of reagent. Only in use in one EfW plant in Europe.
	Gypsum mixing	Some use in EfW facilities in Europe. Not currently used in Australia.
Solidification	Cement based processes	Commonly used globally and Australia.
	Concrete production	Commonly used globally and Australia.
	Bitumen encapsulation	Widely used in Netherlands and Belgium but limited use elsewhere. Not currently used in Australia.
	Carbonation	Not a common process with commercial use limited to the UK.
	Geopolymer	Technology in use in Australia. Designed to generate usable product replacing concrete but requires slag, sand and gravel. Efficacy of metals immobilisation not clear in literature.

Table 3.1 APCr treatment options

Technology	Specific process	Suitability
Thermal Treatment	Vitrification	Process has high energy costs. Currently in use in Japan, Asia, USA and Europe.
	Melting	Process has high energy costs. Currently in use in Japan and Asia.
	Sintering	Process has high energy costs. Currently in use in Europe.

Stabilisation of the APCr with a solid binding agent (eg cement) to reduce leachability was selected as the proposed option. For example, Portland cement stabilisation is a widely used and accepted method for management of leachate from various hazardous wastes, and the required input products and application technology are readily available in Australia. A detailed description of the proposed APCr management is provided in Section 4.4 and in Appendix E.

3.5.7 Conclusion

In conclusion, a range of alternatives were considered during the project development process. The outcome is described in Chapter 4. The project described herein;

- supports the waste strategy in NSW by preserving landfill space, directing residual waste to a higher order option (energy recovery), in compliance with the waste hierarchy and the concept of the circular economy;
- is located on a site designated as an Infrastructure Priority Area by the NSW Government EfW Infrastructure Plan;
- has been located on disturbed land to minimise impacts. During the studies the access road was relocated to avoid wetlands and areas of native vegetation;
- uses the most common form of EfW technology; and
- will be complementary to the existing land uses at the Eco Precinct which have developed since 2004 and is compliant with land use zoning and objectives for the land.

Chapter 4

Project description

4 Project Description

4.1 Project overview

The project consists of the construction and operation of the ARC, an ERF for the thermal treatment of residual MSW and C&I waste feedstock, and supporting infrastructure. The project has been classified as SSD under the EP&A Act as it is both 'electricity generating works and heat or co-generation' (Section 20) and 'waste and resource management facilities' (Section 23) under Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021.

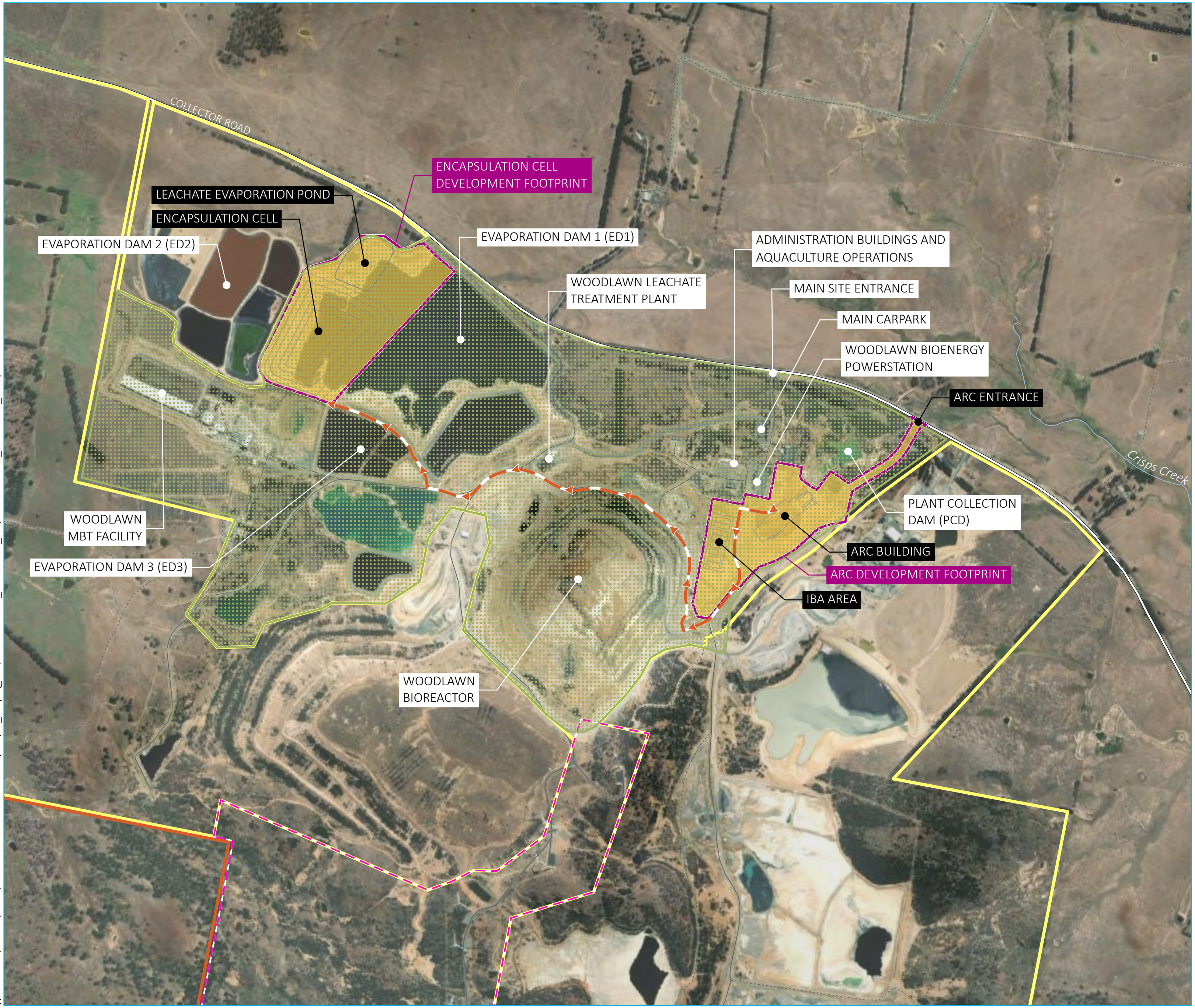
Table 4.1 provides an overview of the project with further detail in subsequent sections. An overview of the development footprint is presented in Figure 4.1.

Table 4.1 Project overview

Project element	Summary of the project	Section where described further
The ARC building	The ARC building will house the energy recovery facility and will be fully enclosed. The building will be approximately 54 m at the highest point of the roof, with a stack of approximately 85 m in height. The building will comprise three levels; ground floor housing the energy recovery facility, and levels one and two which protrude from the south-eastern side of the building, including administration facilities and an education centre. Residual waste feedstock will be processed within the ARC building to generate electricity, through various stages as described in Section 4.3. The ARC process will generate residual by-products (IBA and APCr) that will be managed on site, as described in Section 4.4. An enclosed transfer conveyor will move the IBA from the ARC building to the IBA area. APCr (once stabilised) will be transported to the encapsulation cell. The Woodlawn ARC Design Report is provided in Appendix C.	Section 4.3 and 4.4
Annual throughput	The ARC will have the capacity to process up to 380,000 tpa of residual waste feedstock and will have an electrical generation capacity of up to 30 MW.	
Incinerator bottom ash (IBA) area	The IBA area provides for the processing of IBA for reuse and or disposal and includes screening, metals recovery and maturation. Construction and use of the IBA area, located to the west of the ARC building, will include: • the IBA processing building; • IBA maturation pad (for IBA maturation and stockpiling of the resultant incinerator bottom ash aggregates (IBAA)); and • associated infrastructure for wastewater and leachate management.	Section 4.3 and 4.4
Encapsulation cell	The encapsulation cell will involve staged construction and operation of a lined and engineered landfill cell for encapsulation of the residual by-products (APCr) from the flue gas treatment (FGT) system. The encapsulation cell will be located approximately 1.8 km north-west of the ARC building within the Eco Precinct. Stabilised APCr will be transported via the internal road network from the ARC building by truck to the encapsulation cell.	Section 4.3 and 4.4
Ancillary infrastructure	Construction and use of ancillary infrastructure will include: • sub-contractors lay down area; • a new substation for export of generated electricity; and • utilities.	Section 4.3

Table 4.1 Project overview

Project element	Summary of the project	Section where described further
Development footprint	The project's development footprint is 38.4 ha, shown on Figure 4.1.	
Water management	Water management systems will include: • construction stormwater management; • operational stormwater management systems for the access road, ARC building and IBA area; • operational water management including water supply, process water management and wastewater management; and • surface water and leachate management at the encapsulation cell.	Section 4.6
Fire control	The ARC will include a fire safety system, and will be designed in accordance with the Building Code of Australia (BCA).	Appendix FF
Fuel and chemical storage	Construction and use of diesel and chemical stores as described in Section 8.16.	Section 8.16
Transport and access	Construction and use of: • a new site access road and intersection with Collector Road; • internal access roads, car and bus parking facilities; • a container marshalling area; and • weighbridges for inbound and outbound vehicles.	Table 4.4 and Section 4.3.1iii
Workforce	Construction: approximately 300 construction jobs. Operation: approximately 40 full time equivalent (FTE) operational jobs.	Section 4.7.2
Hours	Construction: 24 hours per day, seven days a week. Operation: 24 hours per day, seven days per week. Receival of residual waste feedstock via road to the ARC: 6.00 am to 10.00 pm, Monday to Saturday.	Section 4.7.2



KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- APCr transport route
- Major road
- Minor road
- Vehicular track
- Watercourse

Source: EMM (2022); Veolia (2022); DFSI (2017)

0 250 500 m

GDA 1994 MGA Zone 55

N

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Project layout

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.1

creating opportunities

4.2 Development footprint

The development footprint and transport route between the ARC building and encapsulation cell, shown in Figure 4.1, cover parts of the following land parcels:

- Lots 1 and 2 DP1179305;
- Lots 4, 5 and 6 DP830765;
- Lot 8 DP534616; and
- Lots 25 and 30 DP754919.

The development footprint and all surrounding land within the Eco Precinct is owned by the applicant, Veolia.

The development footprint represents the extent of actual surface disturbance proposed by the project and assessed in the EIS. The development footprint was refined from a broader area of investigation, based on environmental assessments, project engineering and design iterations of the project. All new works and disturbance for the project will occur within the development footprint.

4.3 Project layout and design

The primary components of the project are the ARC and the encapsulation cell. The layout and design of these components are described below and are based on the design developed for the project provided in Appendix C. The EIS has been prepared based on the design and project layout described in this chapter and the following key technical and design reports:

- Woodlawn ARC Design Report – Appendix C;
- Woodlawn ARC Process Overview – Appendix D;
- Ash Management Study – Appendix E; and
- Encapsulation Cell Design Report – Appendix F.

The project will continue to be optimised during detailed design.

4.3.1 The ARC

The portion of the development footprint encompassed by the ARC building and ancillary infrastructure, IBA area and new access road and intersection is referred to broadly as 'the ARC', shown in Figure 4.2. This area currently contains former mine plant infrastructure, water management infrastructure (plant collection dam) and other disturbed areas subject to ancillary waste management operations.

The ARC consists of the following components listed in Table 4.2 with corresponding numbers shown in Figure 4.3.

Table 4.2 Key components of the ARC (refer to Figure 4.3)

Key infrastructure	Key components[1]
The ARC building	• Air cooled condenser (ACC) (10) • Store (11) • Turbine hall (13) • APCr stabilisation plant (14) • Flue gas treatment (FGT) system (17) • Demineralisation water treatment plant (adjacent to FGT system (17)) • Maintenance access corridor (18) • Workshop (19) • Boiler hall (20) • Waste bunker (22) • Entry and reception (23) • Enclosed IBA transfer conveyor (from the ARC building to the IBA area) (24) • Tipping hall (25) • Central control room (CCR) (34) • Diesel tanks (31) • Administration and education areas (23, 33, 35)
IBA area	• The IBA processing building (30) • IBA maturation pad (including stockpiles) (27) • Associated infrastructure for wastewater and leachate management (15)
Ancillary infrastructure	• Utilities and services including the ERF substation (5) • Fire water tanks (12) • Sub-contractors laydown area (9) • Plant collection dam (2) • ARC stormwater retention dam (7) • IBA stormwater settling pond (15) • Waste water irrigation (16) • Raw water feed tank (32)
Access and internal road network and infrastructure	• ARC site entrance (2) • Bus drop off (26) • Carpark (28) • Incoming weighbridge (21) • Outbound weighbridge (8) • Container marshalling area (29)

Notes: 1. Number refers to location of each component on Figure 4.3.

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Source: EMM (2022); Veolia (2022); DFSI (2017)

0 100 200 m

GDA 1994 MGA Zone 55

N

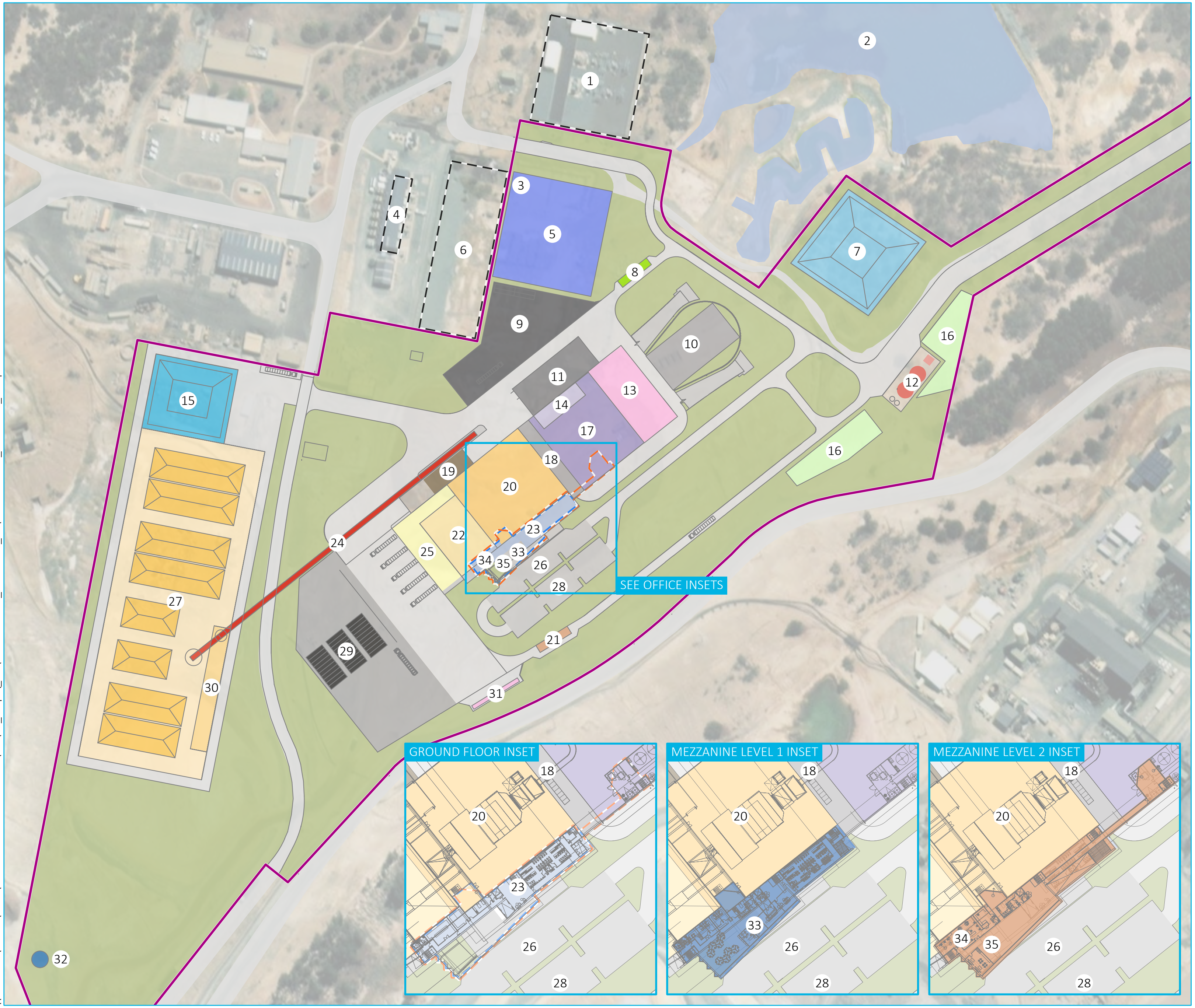
KEY

- Development footprint
- Site layout detail
- Major road
- ARC building
- ARC substation
- IBA area

ARC development footprint

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.2

EMM creating opportunities



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Source: EMM (2022); Veolia (2022); DFSI (2017)

0 100 200 m

GDA 1994 MGA Zone 55

N

KEY

Development footprint

Site layout detail

Mezzanine level 1

Mezzanine level 2

Proposed operations

1 Existing Woodlawn substation
2 Existing plant collection dam (PCD)
3 HV connection point
4 Existing Woodlawn bioenergy power station
5 ARC substation
6 Existing hub 2 power station expansion
7 ARC stormwater retention dam
8 Outbound weighbridge
9 Sub-contractors area
10 Air cooled condenser (ACC)
11 Store
12 Fire water tanks
13 Turbine hall
14 APCr stabilisation plant
15 IBA stormwater settling pond
16 Waste water irrigation
17 Flue gas treatment (FGT)
18 Maintenance access corridor
19 Workshop
20 Boiler hall
21 Incoming weighbridge
22 Waste bunker
23 Entry and reception
24 IBA conveyor
25 Tipping hall
26 Bus drop-off
27 IBA area
28 Carpark
29 Container marshalling area
30 IBA processing building
31 Diesel tanks
32 Raw water feed tank
33 Office and administration (Mezzanine level 1)
34 Central control room (CCR) (Mezzanine level 2)
35 Administration and education area (Mezzanine level 2)

ARC building, IBA area and ancillary infrastructure

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.3

creating opportunities

i The ARC building

The ARC building will be fully enclosed, housing the energy recovery facility including the key components listed in Table 4.2. The ARC building is approximately 54 m above ground level at the highest point of the roof, with a stack of approximately 85 m above ground level. The ground floor houses the energy recovery facility and accounts for the majority of the building footprint. Two mezzanine levels are included in the ARC building which protrude from the south-eastern elevation, above the entry and reception. These mezzanine levels will provide administration facilities and amenities for staff, educational exhibits for visitors and a viewing area of energy recovery facility and equipment. The ground floor and level 1 and 2 mezzanine layouts are presented in Figure 4.3.

The ARC will utilise moving grate technology, with a dedicated flue gas treatment (FGT) system, which is the most commonly used ERF technology worldwide. Section 4.4.1 provides a description of the process within the ARC building, including the FGT system which is a key element of the ARC.

The energy recovery process involves the placement of residual waste feedstock onto a grate, which moves through a drying and combustion process within a combustion chamber. This occurs within a controlled air-flow environment, at temperatures of more than 850°C, with a residence time of at least two seconds. This high intensity combustion generates heat, which is used to produce steam in a purpose-built boiler. The steam drives a turbine to generate electricity, which in turn is exported to the power grid.

Figure 4.4 provides an artist's impression of the ARC building. The external appearance of the ARC building is discussed further in Section 8.13.

Residual by-products will be generated by the ARC from the waste combustion and the FGT processes. These residual by-products are:

- IBA;
- boiler ash; and
- filter bag residues.

IBA is material discharged from the combustion grate and collected below the combustion chamber. IBA is formed from the inorganic content of the waste feed and contains varying quantities of non-combustible materials such as glass, ceramics, brick, concrete and metals (ferrous and non-ferrous) in addition to clinker and ash, depending on the composition of the waste being combusted. IBA screening, maturation and management is explained further in Section 4.4.2. Note, the recovery of metals for recycling is described in Section 4.4.2 and shown in Figure 4.7.

The waste combustion processes will also produce boiler ash, which is the particulate matter removed from the flue gas stream. The FGT system produces air pollution control residues (APCr), which comprises a combination of fly ash and filter bag residues collected as the flue gas passes through the baghouse filtration system. APCr is generated by the FGT system and managed and stabilised in the ARC building, prior to being transported to the encapsulation cell. This is described in Section 4.4.1iv.

Artist's impression of the ARC building

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.4

EMM
creating opportunities

Table 4.3 provides the key inputs and outputs from the energy recovery process. The Ash Management Study (Appendix E) provides a detailed assessment of the residual outputs from the energy recovery process. A firing diagram and energy balance of the ARC is included in Appendix D.

Table 4.3 Anticipated annual residual waste feedstock and by-products

	Waste feedstock input		Residual waste generation	
	Waste (MSW)	**Waste (C&I)**	**IBA**	**APCr**
Approximate annual mass (t)	Up to approximately 304,000 t (80% of residual waste feedstock)	Up to approximately 76,000 t (20% of residual waste feedstock)	Up to approximately 76,000 t (20% of residual waste feedstock and up to 2% metal recovery for recycling)	Up to approximately 15,200 t (4% of residual waste feedstock)

ii IBA area

The IBA area will consist of:

- the IBA processing building (semi-enclosed structure);
- IBA maturation pad (hardstand area for stockpiling); and
- infrastructure for wastewater and leachate management.

IBA will be conveyed from the ARC building to the IBA processing building where it will be screened and separated via a series of vibratory screens, conveyors, magnetic overband separator (or ferrous metals separator), a trommel, and an eddy current separator. The IBA processing building will be a three-sided partially enclosed structure located on the south-east corner of the IBA area approximately 75 m long, 10 m wide and 11 m high with walls to the north, east, south and a roof; the western side of the building will be open. The building will be clad in metal sheeting.

Following processing the IBA will be stockpiled in windrows up to 5 m in height on the maturation pad for a maturation period of 1–3 months. The IBA maturation pad will have the capacity to stockpile up to 19,000 t of IBA.

The matured aggregate produced, IBAA, is likely to be classified as general solid waste (GSW) and as such is suitable for disposal to an appropriately licensed landfill without treatment. Processing and management of the IBA will be completed to ensure consistency of the output material and to enhance the potential for beneficial re-use in the future. The IBA process is described further in Section 4.4.2.

iii Ancillary infrastructure

Table 4.4 provides a description of the ancillary infrastructure. The design plans are provided in Appendix C.

Table 4.4 Description of ancillary infrastructure

Ancillary infrastructure component [1]	Ancillary infrastructure description
Utilities and services including the ERF substation (5)	An existing Essential Energy owned substation, the Woodlawn Zone Substation, is located within the development footprint adjacent to the ARC building. The Woodlawn Zone Substation is a 66/11 kV substation, supplied by two 66 kV feeders, which connect to Essential Energy substations at Goulburn and Bungendore, respectively. A new, dedicated substation will be constructed as part of the project as indicated on Figure 4.2 to export electricity from the project to the grid. The substation and connection infrastructure will typically include: • 11 kV cabling from the steam turbine generator within the ARC to the new substation; • civil works for the construction of the substation; • upgrading the transformer bay, including 66 kV bus-section, circuit breaker and isolators; • upgrading transformer in accordance with the sites export electricity generation output; • installation of protection systems; and • connection of the 66 kV overhead feeder to the existing distribution lines. The substation will contain a step-up transformer and switching and augmentation equipment in accordance with national electricity rules. All other associated electrical works that are typically external to the development site will be under a separate development process (refer to Section 1.5).
Fire water tanks (12)	A hydrant water cannon and sprinkler system will be supplied from an on-site water storage supply tank via diesel pumps.
Sub-contractors laydown area (9)	This area will accommodate the temporary structures needed to run planned maintenance shutdowns as well as the materials, parts and equipment.
Water management infrastructure	**Amenities water supply and wastewater management.** Site amenities will be supplied by rainwater tanks, which will capture runoff from select roof areas within the ARC. Water will be treated to a suitable quality for use in amenities. Alternative supplies (such as trucked in water) may be required during drought conditions. A new on-site wastewater system will be established to manage wastewater (ie sewage) produced within the ARC's amenities. The system will be designed and operated in accordance with the methods described in *Designing and Installing On-Site Wastewater Systems* (WaterNSW 2019b). **Stormwater management** The following stormwater management systems will be developed: • Access road stormwater system – this system will manage stormwater runoff from the northern portion of the access road that is not within the plant collection dam (PCD) catchment. • ARC stormwater system – this system will manage stormwater runoff from the ARC and surrounding hardstand and landscaped areas. • IBA area stormwater system – this system will manage stormwater runoff from the IBA area.
Access and internal road network infrastructure	Residual waste feedstock will be transported to site in accordance with existing development consents as described in Section 2.3. As described in Section 4.4 waste containers will be transported from the IMF to the ARC and will access the ARC building via a new access road and intersection with Collector Road, which will provide access and egress to the ARC building. The location of the access road and intersection are shown in Figure 4.2. Trucks will make a left turn into the access road from Collector Road and travel across a new inbound weighbridge. Trucks will proceed to the container marshalling area where containers will either be directly unloaded to the tipping hall as described in Section 4.4, or temporarily stored on the container marshalling hardstand area until required. Trucks will move around the ARC building and exit the ARC via the outbound weighbridge and the access road to Collector Road. A dedicated parking area for the ARC building is shown on Figure 4.2.

Notes: 1. Number refers to location of each component on Figure 4.3.

4.3.2 Encapsulation cell

An encapsulation cell is proposed as part of the project to manage the APCr generated by the ARC. The encapsulation cell and associated infrastructure is located in a disturbed area within the footprint of the existing Evaporation Dam 1 (known as ED1), shown in Figure 4.5. The encapsulation cell is within the Eco Precinct, and approximately 1.8 km from the ARC building. The existing ground surface elevation in the proposed location of the encapsulation cell is generally between RL 785 m to 790 m.

Following stabilisation (described in Section 4.4.1), APCr will be classified as restricted solid waste which will require disposal in a purpose-built encapsulation cell designed in accordance with the NSW EPA's *Environmental Guidelines Solid Waste Landfill Second Edition 2016* (the Landfill Guidelines) (EPA 2016). The encapsulation cell reference design is presented in Appendix F. It will comprise a lined and engineered landfill cell for the disposal of stabilised APCr. The encapsulation cell will be constructed in a staged manner over the life of the project.

The stabilised APCr will be transported via the internal road network from the ARC building by truck to the encapsulation cell (described further in Section 4.4.3). Figure 4.5 outlines the design layout of the encapsulation cell.

The design for the encapsulation cell has been prepared in accordance with the Landfill Guidelines (EPA 2016) and the SEARs, which require that the EIS must address key issues of waste management including a 'detailed encapsulation cell design that demonstrates the contaminants can be adequately managed'. The design of the encapsulation cell is described further in Section 4.4.3 and Appendix F.

4.4 Uses and activities

This section describes the uses and activities for the project within the ARC building, IBA area and encapsulation cell.

4.4.1 The ARC building

The ARC building primarily houses the energy recovery facility, which has been described in Section 4.3.1i and shown on Figure 4.3. In addition to the plant, the ARC building also includes two mezzanine levels which protrude from the south-eastern elevation, and will contain administration facilities and amenities for staff, educational exhibits for visitors and viewing areas of the energy recovery facility within the ARC building.

This section contains a description of the energy recovery process that occurs within the ARC building, and consists of the following stages:

- Stage 1: receival of residual waste feedstock and temporary storage.
- Stage 2: combustion and heating.
- Stage 3: energy recovery and electricity generation.
- Stage 4: flue gas treatment.
- Stage 5: residue handling and treatment.

A schematic depicting the key stages in the process listed above is provided in Figure 4.6 and discussed in the following sections.

Further technical detail on the process can be found in the Woodlawn ARC Process Overview report in Appendix D, including key process specifications, the energy balance, and the firing diagram.

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Source: EMM (2022); Veolia (2022); DFSI (2017)

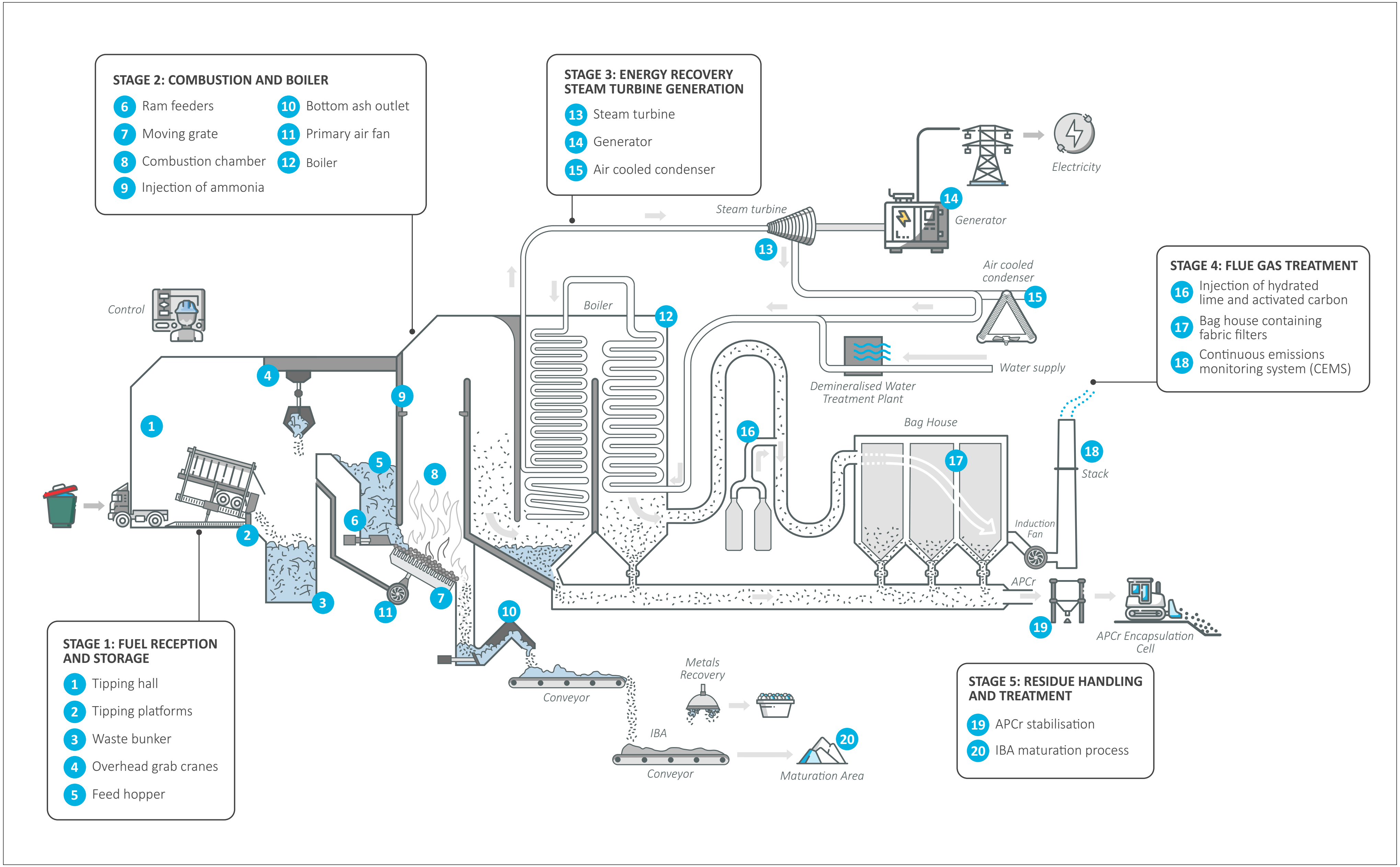
0 100 200 m
GDA 1994 MGA Zone 55
N

KEY
- Development footprint
- APCr transport route
- Encapsulation cell
- Leachate evaporation pond
- Major road

Encapsulation cell development footprint

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.5

EMM
creating opportunities



Schematic of the ARC process

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.6

i Stage 1 receival of residual waste feedstock and storage

Residual waste feedstock will be transported to the Eco Precinct in containers by truck from the Crisps Creek IMF. Trucks will enter the ARC, within the Eco Precinct, using a dedicated access road at the intersection with Collector Road (Figure 4.1). Trucks will be weighed at the incoming weighbridge on entry to the ARC, before proceeding to the container marshalling area, where containers will either be directly unloaded to the tipping hall or temporarily stored on the container marshalling hardstand area until required. In order to ensure a continuous supply to the ARC across weekends and other periods, storage of incoming feedstock in containers is necessary; this is detailed in the Waste Delivery Plan in Appendix G.

The **tipping hall (1)** (see Figure 4.6) will be an enclosed hall where residual waste feedstock will be received by truck. The hall will include unloading bays for depositing residual waste feedstock into the waste bunker. **Tipping platforms (2)** will be used for unloading. Trucks with containerised residual waste feedstock will reverse into the tipping hall where the trailer and container will be positioned on a tipping platform, the prime mover will be unhooked and moved forward, the container door will be opened, and the tipping platform will be activated to tip the residual waste feedstock into the **waste bunker (3)**. Tipping platforms would be a combination of fixed and mobile platforms. A mobile platform will be temporarily used in the event a fixed platform breaks down.

During operations, the tipping hall will be maintained under negative air pressure, with air from the hall being drawn into the furnace. The tipping hall will also be equipped with an extraction system. This, and the fast closing truck access doors, which remain closed unless a truck is entering or departing the tipping hall, minimise the potential for release of odour to the environment. During maintenance or shut down periods, an auxiliary ventilation system will extract air at a rate of approximately 10,000 m3/hour from above the waste bunker, discharging via a filtration system to a stack to ensure that odours from the reception hall and bunker are dispersed in a manner that will ensure that the requirements of BAT 21 are met.

The tipping hall will have a fire control system incorporating remote and automatically controlled water cannon, sprinklers, fire hydrant coverage and infra-red cameras for detecting hot spots within the waste bunker.

From the waste bunker, the waste will be lifted by **overhead grab cranes (4)** and fed into a **feed hopper (5)**. The overhead grab cranes will be used to mix and distribute the material in the waste bunker and extract oversized or non-conforming waste, if required, prior to feeding the waste into the feed hopper. The cranes are able to be operated in fully automatic, semi-automatic and manual modes, and each will be sized to carry out all functions by itself, to ensure operations can continue in the case of crane breakdown.

ii Stage 2 combustion and heating

a Feed hopper

The feed hopper will be used to deliver the waste via a chute onto a moving grate, ensuring continuous delivery of the residual waste feedstock onto the grate for combustion. **Ram feeders (6)** will be used to push the waste from the chute onto the **moving grate (7)** inside the **combustion chamber (8)**. The chute will be designed to ensure the waste is held in an oxygen depleted environment, which will reduce the risk of fire propagation from the combustion chamber to the tipping hall and waste bunker. The fire control system will incorporate water cannons, sprinklers, fire hydrant coverage and infra-red cameras for detecting hot spots.

Ammonia (9) will be injected into the hot gas stream for the purpose of controlling nitrogen oxides (NOx) within the combustion chamber where the temperature conditions are correct for the denitrification process to occur. This process is discussed further in Section 4.4.1iv.

b Grate system

The ARC will operate using moving grate technology with a single processing line. The angled grate will consist of alternating rows of fixed and moving grate bars, which will push the residual waste feedstock forward whilst providing a tumbling motion to the feedstock. This is designed to facilitate effective drying, ignition, combustion, energy release and complete burn-out before the **bottom ash outlet (10).**

The combustion chamber will be designed to retain the heated gases resulting from combustion at a temperature above 850°C for at least two seconds in compliance with the NSW EPA EfW Policy Statement (June 2021). This process will be tightly controlled to ensure optimum combustion to both facilitate destruction of the residual waste, whilst maximising heat production.

Typically, the process will be designed for continuous waste combustion in the range between 60% and 108.5% of the thermal design load. Short-term peaks caused by the non-homogeneity of the residual waste will be absorbed by the system up to 110% of the design load. More details of the reference specifications of the plant can be found in the Woodlawn ARC Process Overview report in Appendix D.

As a contingency measure and in case the temperature in the secondary combustion chamber drops below the specified temperature range, diesel fired auxiliary burners will automatically start operation. Evidence shows that such activation occurs very rarely. Predominantly the burners will remain in a stand-by position and will be cooled by cooling air fans. The auxiliary burners will, however, routinely be used for start-up and shut down of the ARC. No residual waste will be fed onto the grate until the diesel burners have raised the temperature of the furnace to 850°C during start-up.

Air will be drawn from the bunker by the **primary air fan (11),** minimising the potential for odour escape from the process. The air will be pre-heated by a steam preheater and directed under the grate. A secondary air system will deliver combustion air to burn out and mix the flue gases, located at the top of the boiler.

c Boiler

The **boiler (12)** will be contained within a boiler hall. The thermal energy (heat) released during the combustion process will be transferred to the boiler, where it will be absorbed by the feed water, converted into steam, superheated and transferred to the turbine hall (steam turbine), which is described further in stage 3. The process will use heat exchangers to generate steam heated typically to around 400°C at a pressure of 60 bar. A demineralisation water treatment plant will be located within the ARC building to supply and reuse water from the steam circuit.

Feed water will be supplied to the steam-water circuit from the feed water tank by pumps. Water supply for the ARC is discussed in Section 4.6.2.

iii Stage 3 energy recovery and electricity generation

The turbine hall will consist of the **steam turbine (13)**, which will be powered by the steam generated in the boiler hall. Electricity will be generated in the turbine hall by a **generator (14)** coupled to the steam turbine.

The electricity generated will supply the power requirements of the complete ARC (parasitic load), while the balance will be exported to the grid via the ARC substation.

Alternatively, the high-pressure steam would be directed to the **air cooled condensers** (ACC) **(15)** via a turbine bypass station. During start-up or turbine shut-off the high-pressure steam will be completely bypassed to the ACC for condensation.

The steam turbine will be fitted with a medium pressure (typically 10–12 barg) extraction point for operation in a combined heat and power (CHP) mode, should suitable offtaker(s) be identified. The maximum heat output would be approximately 70 MWth.

After passing through the steam turbines the expanded steam will be condensed in the ACC. The condensate will be returned to the feed water tank. Water supply for the ARC is discussed in Section 4.6.2.

The thermal power output is dependent on the calorific value of the residual waste feedstock and so will vary during the operation of the project as it will be designed to adjust to changes in calorific value of the residual waste feedstock.

iv Stage 4 flue gas treatment system

The FGT system is a comprehensive and dedicated system specifically designed to manage the flue gas from the ARC. It will incorporate a number of stages including circulation of the flue gas to limit the formation of particulates, the addition of reagents to remove contaminants and the use of fabric filters to remove particulates from the flue gas prior to discharge into the atmosphere.

Flue gas is a mixture of gases resulting from combustion and other reactions in the combustion chamber. Untreated flue gases from the ARC contain substances such as particulate matter, acid gases or organochlorides, hydrochloric acid (HCl) and hydrogen fluoride (HF), sulphur dioxide (SO_2), nitrogen oxides (NOx), heavy metals (mercury, lead, cadmium, chromium, copper, zinc, nickel, etc), carbon monoxide (CO), together with highly toxic polyhalogenated aromatics such as dioxins, a class of species including polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs). Therefore, the FGT system will be a critical element of the ARC required to meet stringent air quality standards.

The FGT system controls the emissions of NOx, acid gases, heavy metals and dioxins. The products of incomplete combustion such as carbon monoxide and volatile organic compounds (VOCs) will be managed through efficient combustion control on the grate and combustion chamber.

The generation of NOx will be controlled in the combustion process, with the secondary air injection controlling the temperature of combustion and the amount of free oxygen in the combustion zone. This limits the amount of excess air, thereby reducing the potential for NOx formation in the combustion zone.

After combustion control, the control and abatement of NOx emissions will be achieved through selective non-catalytic reduction (SNCR) technology, whereby the combustion chamber has a SNCR system using ammonia. Ammonia will be injected (9) into the hot gas stream for the purpose of controlling NOx. This will occur in the post-combustion chamber where the temperature conditions will be correct for the denitrification process to occur. Typical reducing agents include urea or ammonia water.

The combustion of waste in the ARC will generate acid gases and small amounts of dioxins, furans and heavy metals in the flue gas. These pollutants will be abated and or neutralised as follows:

- **Injection of hydrated lime (16)** – hydrated lime will be injected for the purpose of neutralising acid gases.
- **Injection of activated carbon (16)** – activated carbon will be injected to adsorb dioxins, furans and other contaminants including heavy metals. This will occur prior to the fabric filters such that the residues are captured before emission to atmosphere.

Hydrated lime and activated carbon will be metered and injected into the reactor which will ensure turbulent flow and mixing of the hydrated lime, activated carbon and flue gas, to maximise the neutralisation of acid gases and adsorption of dioxins, furans and heavy metals.

The flue gas will be directed through a **bag house (17)**, which will contain fabric filter bags. The flue gas will be drawn through the bags which will remove fine dust particulate, spent lime and activated carbon. Particulates collected in this process are known as APCr, which will be temporarily stored in a silo prior to stabilisation and transport to the proposed encapsulation cell on site.

Cleaned gases will be released through the stack, located next to the bag house and approximately 85 m in height. These gases will be monitored continuously to ensure they meet strict environmental legislation via the **continuous emissions monitoring system (CEMS) (18)**. The system will be managed automatically by the distributed control system (DCS), which will monitor the raw exhaust gases and automatically adjust dosing of reagents to provide a consistent output from the stack, even with variability in the waste feedstock. In relation to this type of system the US EPA notes:

> Fabric filters using mechanical shaking, reverse air, and pulse-jet cleaning are fundamentally different from ESPs and venturi scrubbers in that they are not "efficiency" devices. A properly designed and operated fabric filter using one of these two cleaning methods will yield a relatively constant outlet particle concentration, regardless of inlet load changes (Roddis et al 2020)

This is an important concept, as it means that the FGT system can accept a considerable variation in the feedstock and yet maintain a constant flue gas quality at the stack. Roddis et al (2020) notes that the manufacturers guarantee for the FGT system performance from one major supplier provides for a range of acceptable waste inputs. The paper also provides data from a plant in Germany, comparing the variability of feedstock processed over a 6-year period with the consistency of the flue gas emissions.

v Stage 5 residue handling and treatment

a IBA

Following combustion, approximately 20% of the original waste by weight remains as IBA. It will be discharged through an ash quencher to rapidly reduce its temperature and then wet ash extractors will remove the IBA from the moving grate quench pits. The IBA will pass over a grizzly screen to remove large items, before being discharged and collected on a conveyor from below the moving grate. Stockpiling bays and open topped bins will collect oversize material.

IBA will then be transferred by conveyor to the IBA area for screening and maturation. IBA maturation is discussed further in Section 4.4.2.

b APCr

The APCr will be collected from the boiler hall and from the filter bags within the bag house. It will be transferred to a collecting silo (APCr stabilisation (19)).

The APCr is expected to be classified as a hazardous waste, which requires treatment (stabilisation) to enable it to be disposed to a restricted waste landfill. This stabilisation process will occur within the ARC building. After stabilisation, the APCr will be classified as restricted solid waste under the *NSW EPA Waste Classification Guidelines*. This process will involve the following steps:

1. Storage of ash: APCr will be transferred to dedicated silos with sufficient storage capacity for five days production (approximately 180 m^3).

2. Stabilisation: APCr will be transferred from the silos to the adjacent stabilisation facility, which will involve the mixing of a solid binding agent (eg cement) with the APCr. A mixer will be used to combine the APCr with the solid binding agent. The resulting mix is a granular aggregate, typically with a small fraction size of minus 40 mm. Up to 24 t of stabilised APCr may held in storage bins under cover within the ARC building prior to transport to the encapsulation cell.

3. Disposal: The stabilised APCr will be transferred from the ARC building using truck and trailer (or tractor and bin), through the Eco Precinct internal road network and will be unloaded in the encapsulation cell. The transport route from the ARC building to the encapsulation cell is shown on Figure 4.1.

4. Compaction and curing: To minimise the storage volume of the stabilised APCr, post-placement compaction will be conducted within the encapsulation cell. The process may also involve moisture adjustment followed by spreading and compaction.

The encapsulation cell reference design is described in Section 4.4.3 and Appendix F.

vi Stage 6 water cycle

The operation of the ARC will require water for steam generation, steam conditioning, ash quenching, APCr stabilisation, operation of the FGT system, dust suppression within the IBA area and other miscellaneous uses.

The project will require an ongoing water supply of approximately 245 kL/day or 90 ML/year. This water will be sourced from stormwater harvesting (when available) and groundwater from the Willeroo Borefield (when stormwater is not available). Existing water transfer pipelines will be used to transfer water from the borefield to the ARC. A connection point will be required to connect the ARC to the existing infrastructure. This will be within the ARC development footprint. A demineralisation water treatment plant will be located inside the ARC building. Under some circumstances, surplus effluent from the demineralisation plant may need to be managed externally to the ARC. If this is required, the surplus effluent would be reticulated to ED1.

Details of the operational water management framework are provided in Appendix V.

vii Distributed control system

The processes within the ARC will be controlled by a distributed control system (DCS) which will be operated from the central control room. The DCS allows for operators to monitor and control all aspects of the process. It will receive and log data from instrumentation across the plant, including the continuous emissions monitoring system and all FGT systems. It monitors all essential parameters and controls the process in real time to ensure efficient operations, resolution of any issues and shut down of the process if required. For example the DCS will provide for online adjustment of primary and secondary air flows and fuel feed rate to ensure the combustion process is optimised. The DCS will be programmed with automatic control set points which will include automatic shut down when required.

4.4.2 IBA area

Figure 4.7 illustrates the process that the IBA follows from the ARC building to the IBA area. The IBA area will comprise an IBA processing building (a three-sided structure) and an IBA maturation pad. The IBA area has been designed in accordance with global standards which are further discussed in the BAT Report in Appendix L. The processes are described in the following section.

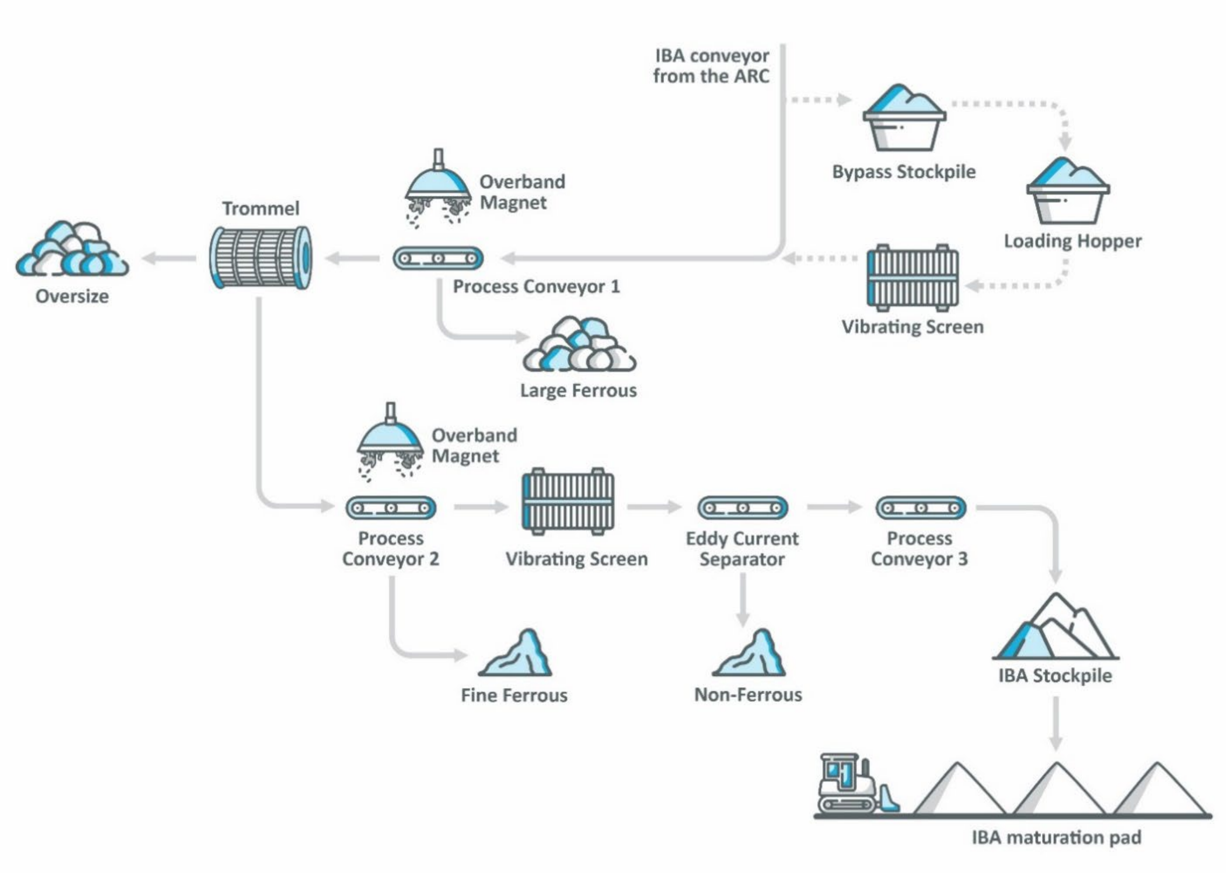


Figure 4.7 IBA maturation process

i IBA screening

There are three basic elements to the screening or separation process:

- removal of ferrous metals;
- removal of non-ferrous metals; and
- separation of oversized particles.

IBA will leave the ARC building via a conveyor system in normal operations to the IBA area, or will be transferred by trucks in open top bins should a breakdown of the conveyor system occur.

Within the IBA processing building, IBA will be delivered via an elevated conveyor (process conveyor 1). Large ferrous metals will be screened out from the IBA via a magnetic overband separator above the conveyor. The conveyor will empty the IBA into a large trommel that agitates the IBA, capturing larger reject materials such as bricks, concrete, and large non-ferrous items. This large reject material will be captured in open top bins. Fines separated by the trommel will fall onto a separate conveyor (process conveyor 2), which will pass under a second magnetic overband separator for removal of fine ferrous materials. A vibrating screen will spread the material evenly before it enters the eddy current separator for removal of non-ferrous materials.

Ferrous and non-ferrous metals removed from the IBA through the screening process will be stored in stockpiling bays and open topped bins for recycling. The removal of metals and reduction in the size and quantity of other products in the IBA will be beneficial as it reduces the metal content available for leaching prior to landfilling.

Following removal of non-ferrous materials, the IBA will be transferred onto a final conveyor (process conveyor 3) that delivers IBA to a dedicated IBA stockpile area prior to placement on the IBA maturation pad.

ii IBA maturation

Following screening, IBA will be transferred via mobile plant (such as a front-end loader) to stockpiles on the IBA maturation pad. Stockpiles will be designed to allow adequate ventilation which assists the maturation process. The IBA maturation pad will be a sealed impervious surface (ie hardstand area) with leachate collection infrastructure (eg perimeter bunds and drains) feeding into the on-site water management system. Leachate control infrastructure captures the leachate for treatment and re-use.

Maturation of the IBA is the process by which the IBA is exposed to the atmosphere for an extended period and results in stabilisation of the IBA to produce incinerator bottom ash aggregates (IBAA). Hydration and carbonation reactions occur within the stockpiles while exposed to the weathering process, reducing the pH and removing soluble salts. This is generally used as a treatment technique prior to reuse applications, however as it reduces the leachability of contaminants remaining in the IBA it is also a beneficial process prior to landfilling.

The time required to stabilise the IBA is influenced by the stockpile conditions, site weather conditions and ash composition. The IBA maturation pad will be a sufficient size to contain up to three months of production volume (19,000 t), with space to manage separate stockpiles each of one month volume to allow for periodic sampling to confirm suitability for disposal or re-use. The maximum stockpile height will be 5 m.

During the commissioning phase and following sufficient maturation and testing of the material, Veolia will consider beneficial re-use of the IBAA, which is further discussed in Section 8.17 and the ash management study in Appendix E.

iii IBAA management and reuse strategy

Following maturation, the IBAA will be ready for either disposal or beneficial re-use as detailed in the ash management study in Appendix E, and summarised below:

- Disposal: during the first six months of operation of the ARC and once laboratory analysis confirms that the material has been characterised, the IBAA will be transported by trucks to the existing Bioreactor landfill for disposal as required.

- Alternative cover: after the actual physical and chemical characteristics of the material can be established, Veolia intends to seek approval for the use of the IBAA as alternative cover material at the Bioreactor landfill and or the encapsulation cell. This reuse of the IBAA would replace clean fill currently trucked to site for use as daily cover.

- Rehabilitation material: similarly, the IBAA may have potential reuse as a rehabilitation material for application within the Eco Precinct, where former mining areas are being progressively rehabilitated. This could occur after testing and receipt of any required approvals.

- Beneficial re-use: in addition, following the initial waste characterisation phase, Veolia intend to investigate the potential for beneficial re-use of the IBAA as construction material. Options for beneficial re-use of the IBA would be revisited periodically, as the Australian EfW and associated resource recovery industries develop.

An IBAA management and re-use strategy will be developed for the project prior to operation and will continue to be reviewed and updated based on beneficial re-use opportunities at the time.

4.4.3 Encapsulation cell

The reference design for the encapsulation cell is described in this section with an overview presented in Table 4.5. The encapsulation cell reference design report is in Appendix F.

Table 4.5 Encapsulation cell design

Stage	Item
Design life, dimensions and perimeter	The encapsulation cell provides approximately 1.5 million m^3 of airspace, which is considered sufficient volume to receive stabilised APCr from the ARC for the life of the project, based on a design life of approximately 25 years assuming annual operation of the ARC at maximum capacity.
Floor levels	• Floor located within existing ED1 evaporation pond. Fill above existing levels to achieve suitable floor grading above anticipated maximum groundwater level. • Floor grading is consistent with the Landfill Guidelines for restricted solid waste landfills. • Floor divided into four major cells.
Leachate management	• Engineered leachate barrier and leachate collection systems consistent with *Landfill Guidelines for restricted solid waste landfills*. Double liner system on floor and walls to provide leachate collection on upper liner and leak detection on lower liner. • Pumped leachate extraction and transfer. • Leachate disposed by evaporation from dedicated evaporation pond. Pond sizing consistent with Landfill Guidelines.
Filling and capping	• Filling begins at southwest corner of cell and generally progresses north. Filling in four major stages of similar volume corresponding to the floor cell areas (refer to Section 4.4 of Appendix F). • Progressive capping construction to reduce leachate generation and potential environmental impacts. • Engineered final capping system consistent with Landfill Guidelines for restricted solid waste landfills.
Final landform	• Landform developed with shallower final slopes on north and east batters to reduce visual impact. • 'Plateau' present at top of landform to facilitate operations; plateau slope consistent with Landfill Guidelines. • Stormwater runoff from final landform will discharge to the ED1 floor area. Detailed design will address the need for channels, ponds or level spreaders for integration with ED1 stormwater infrastructure.
Encapsulation cell operation	• It is anticipated that the encapsulation cell will be licenced by NSW EPA under POEO Act prior to the commencement of operation. • Section 4.5 of Appendix F presents the major operational considerations of the encapsulation cell and leachate evaporation pond.

i Initial construction and establishment

Initial construction and establishment will require excavation for the formation of the floor of the encapsulation cell. Excavated materials would be used as fill for subgrade construction if geotechnically and chemically suitable. There is expected to be an excess of filling required to achieve subgrade levels wholly above the groundwater levels (RL 786 m) and to enable formation of the cell floor to the required geometry. General fill materials, compliant with technical specification requirements will be imported from offsite sources as required to make up any deficit of available suitable onsite fill materials.

ii Lining and leachate management

The design includes a double composite geomembrane base and side slope lining system with a leak detection system to isolate the encapsulation cell from external standing water in ED1 and surrounding water management infrastructure.

Primary leachate drainage from the encapsulation cell will be through a leachate collection system installed above the primary lining system. Extracted leachate will be pumped to a leachate evaporation pond for disposal by evaporation.

The indicative location of the leachate pond for the encapsulation cell within the development footprint is shown in Figure 4.5. The encapsulation cell and leachate pond are wholly within ED1. The exact location of the leachate pond within the development footprint will be determined during detailed design. The sizing and capacity of the leachate pond will be in accordance with the encapsulation cell reference design report in Appendix F, and within the development footprint shown in Figure 4.5.

iii Filling stages

The design has four filling stages which are based on a 25 year design life at maximum waste feedstock rates. Each of the four filling stages, identified as cells 1 to 4, of approximately equal airspace. The landfill cells will be progressively constructed and filled over the life of the ARC. Figure 4.8 outlines the APCr filling stages.

Filling of the encapsulation cell will occur from south to north. Construction of each cell will include:

- foundation preparation;
- fill placement for supporting perimeter bunds/embankments;
- fill placement for cell floor subgrade;
- floor and side wall lining systems;
- leachate collection system; and
- other required infrastructure.

Stabilised APCr will be transported via the internal road network from the ARC building by truck and trailer (or tractor and bin) to the encapsulation cell. Placement and compaction of stabilised APCr will occur, along with placement of suitable daily and intermediate cover soil materials. The design assumes that the total volume of cover materials will be in the order of 12,000 t per year, which would be imported to the Eco Precinct.

iv Capping, closure and final landform

The encapsulation cell will be progressively filled to a final landform with a maximum height at approximately RL 815 m (approximately 30 m above the immediately surrounding ground level). The final capped landform will be contained within the existing ED1 pond embankments. Key capping material specifications are provided in Section 4.11.2 of Appendix F and are compliant with the Landfill Guideline requirements. The final landform will be revegetated. A landscape plan for the encapsulation cell will be prepared as part of detailed design.

YEAR 6 (2033)

1. Bioreactor landfill to height of RL790
2. ARC Operational
3. IBA Area Operational
4. Leachate Treatment Plant (LTP) Operational
5. Evaporation Dam 1 (ED1)
6. Coffer Dam – ED1
7. LC Leachate Dam
8. Evaporation Dam 2 (ED2) – Woodlawn Mine Operator Responsibility
9. EC1 Rehabilitated
10. Encapsulation Cell Stage 2 (EC2) Constructed
11. Evaporation Dam 1 (ED1) South & West sides filled
12. Tailings Dam West (TDW) Rehabilitated Woodlawn Mine Operator Responsibility

YEAR 12 (2038)

1. Bioreactor landfill to height of RL808
2. ARC Operational
3. IBA Area Operational
4. Leachate Treatment Plant (LTP) Operational
5. Evaporation Dam 1 (ED1)
6. Coffer Dam – ED1
7. EC Leachate Dam
8. Evaporation Dam 2 (ED2) – Woodlawn Mine Operator Responsibility
9. EC2 Rehabilitated
10. Encapsulation Cell Stage 3 (EC3) Constructed
11. ED1 South & West sides Rehabilitated
12. Tailings Dam South (TDS) Rehabilitated Woodlawn Mine Operator Responsibility
13. Tailings Dam North (TDN) Rehabilitated Woodlawn Mine Operator Responsibility
14. North of IBA Maturation Pad Rehabilitated
15. Western Ridge Rehabilitated

YEAR 25 (2051)

1. Bioreactor landfill to height of RL840
2. ARC Operational
3. IBA Area Operational
4. Leachate Treatment Plant (LTP) Operational
5. Evaporation Dam 1 (ED1)
6. Coffer Dam – ED1
7. EC Leachate Dam
8. Evaporation Dam 2 (ED2) – Eastern Side Rehabilitated Woodlawn Mine Operator Responsibility
9. EC3 Rehabilitated
10. Waste Rock Dump (WRD) Rehabilitated Woodlawn Mine Operator Responsibility
11. ED1 South & West sides Rehabilitated

Imagery courtesy of

nettletontribe VEOLIA

Figure 4.8 Encapsulation cell filling stages

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4.5 Feedstock for the ARC

The Eco Precinct has approval to receive 1.18 Mtpa of waste by rail from Sydney and 130,000 tpa by road from the local area. The Eco Precinct currently receives approximately 40% of Sydney's residual putrescible waste, as well as a small amount of regional waste by road.

A schematic diagram of the Eco Precinct waste operations and volumes of waste approved and proposed to be transported to the Eco Precinct with the project is shown in Figure 4.9.

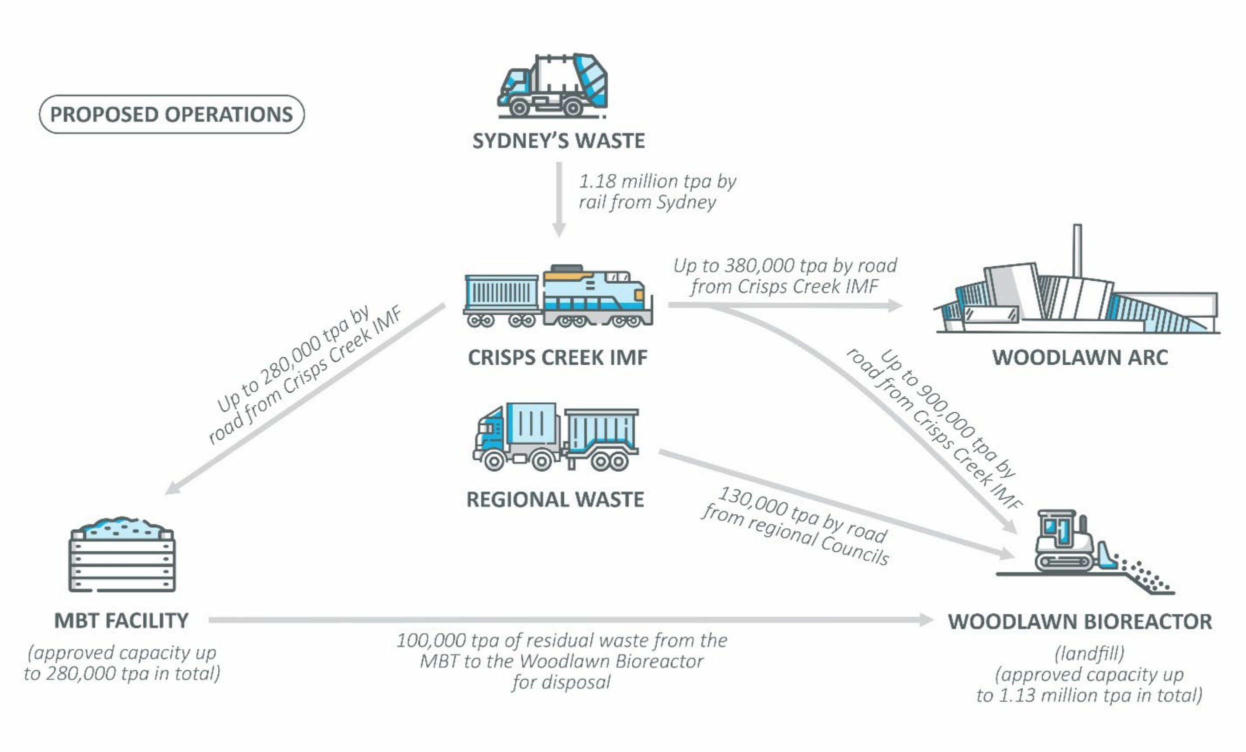

Figure 4.9 Waste volumes transported to the Eco Precinct

Currently, the Eco Precinct is operating below its approved capacity, with the breakdown of residual waste managed on site as follows:

- 143,000 tpa is treated in the MBT facility (of a total of 280,000 tpa approved); and
- 850,000 tpa is disposed of in the Bioreactor (up to 1.13 mtpa approved), including waste by rail from Sydney, regional waste by road and residual waste from the MBT.

The project involves the diversion of up to 380,000 tpa of residual waste feedstock from landfill to the ARC. This is in keeping with the Government's objective of diverting waste from landfill to a higher order use, in this case the recovery of energy.

Residual waste feedstock for the project will be received from the Sydney transfer terminals at Clyde and Banksmeadow, where waste is sorted and containerised for transport by rail to the Crisps Creek IMF, and transport by road to the Eco Precinct, under existing approvals as discussed in Chapter 2.

The feedstock for the ARC will be sourced from within the existing approved waste inputs from Sydney to the Bioreactor and MBT facility, shown schematically in Figure 4.6, and hence this project does not propose any increase in tonnages transported to Woodlawn.

The feedstock will comprise residual MSW and select C&I waste (up to 20%) streams. Residual C&I waste will be sourced from customers with source separation services. The residual MSW is “red bin” waste that is residual after at-source sorting and separation of dry recyclables (such as bottles, cans and cardboard) and organics. Sorting and separation occurs at the household level. This complies with the NSW EfW Policy as discussed further in Chapter 6.

Veolia recognises that quality control of the feedstock is required for compliance with the EfW Policy. Full details of Veolia’s plans for quality control and assurance are provided in the Waste Delivery Plan, Waste Acceptance Plan, and Sampling Analysis and Quality Plan, all included in Appendix G.

Quality control of the waste feedstock is summarised in Figure 4.10. It comprises a number of stages:

- At source sorting at the household or business location. Quality control of the resultant waste is covered by contractual agreements between Veolia and its local government and commercial customers.
- At the transfer terminals:
  - Data is recorded on each load delivered including source and weight. Source separated waste remains separate through the terminal.
  - Each load is tipped at a designated area where it is visually inspected by a front-end loader operator, who removes all identified non-conforming waste, which is aggregated in a designated location for disposal by other means.
  - Following sorting, the approved load is pushed into a designated compactor chute. There are two chutes, one for conforming residual waste destined for the ARC, the other for loads destined for other facilities at the Eco Precinct including the MBT and the Bioreactor.
  - Each load will be containerised and labelled with its weight and destination (ARC or other) and then transported to the Eco Precinct by rail and truck.
- At the ARC:
  - Based on the manifest each load will be directed from the IMF to the appropriate facility at the Eco Precinct.
  - At the ARC the container will be unloaded into the waste bunker. In the bunker the waste will be inspected by the grapple crane operator and any large, visible, remaining, non-conforming materials will be removed using the waste grapple crane and dropped through a reloading hopper into a skip bin, which will periodically be directed to the Bioreactor. The grapple crane operator will also be mixing the waste providing further opportunities to identify non-conforming materials.

Periodic detailed sampling and monitoring of the waste received by the Woodlawn ARC will be undertaken to determine the composition of the feedstock. This is further described in the Sampling Analysis and Quality Plan at Appendix G.

The project is not proposing any changes to Veolia’s current approved waste movements. As such the ARC will operate under Veolia’s existing biosecurity approvals.

A detailed analysis of the potential residual waste feedstock available for this project has been prepared, provided in Appendix I. It indicates that there is ample supply of residual waste from Greater Sydney to support this and other projects into the future. This reinforces the findings of the WASMS that a number of ERFs will be required for the Sydney basin by 2040.

By diverting waste that is currently disposed to landfill to a higher order use, namely energy recovery, this project provides a more beneficial waste management solution in keeping with the waste hierarchy.

Further discussion of the compliance with the resource recovery criteria included in the EfW Policy Statement is provided in Chapter 6.

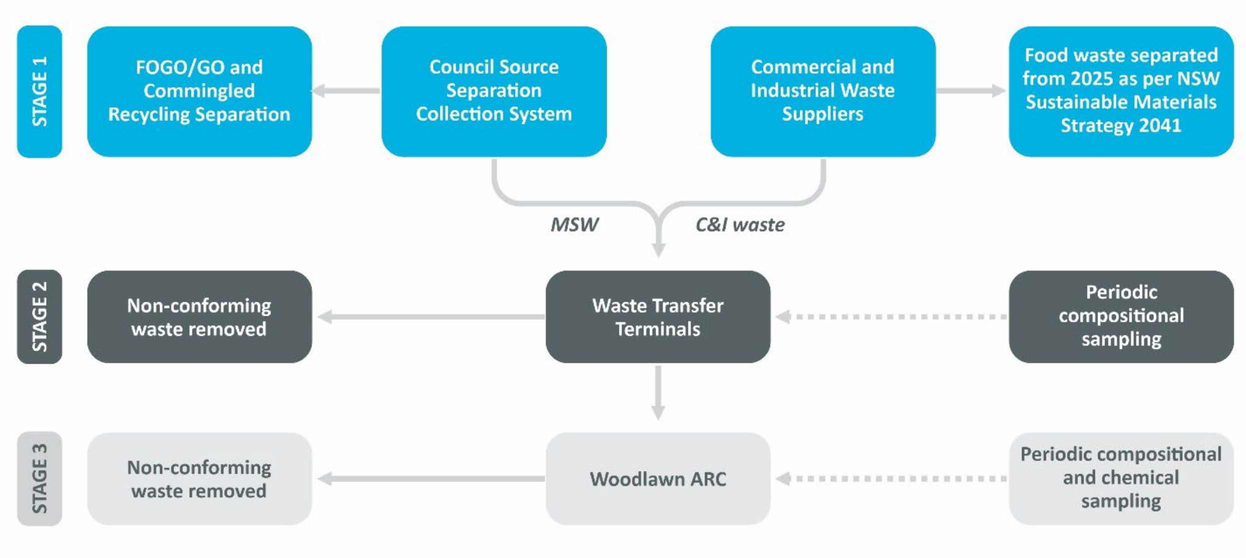

Figure 4.10 Quality control of the waste feedstock

4.6 Operation

4.6.1 Operational hours and workforce

The following hours of operation will occur at the project:

- Operating hours for ARC: 24 hours per day, seven days per week.
- Annual shutdowns: shutdowns for maintenance will be undertaken annually for a period of up to three weeks.
- Receival of waste to site: 6.00 am–10.00 pm Monday to Saturday as per existing consent.

A total of 40 full-time equivalent site based operational roles are expected to be required for the project.

4.6.2 Water management

The water management system will be integrated with the existing surface water management system at the Eco Precinct.

The stormwater management system will comprise:

- Access road stormwater system – this system will manage stormwater runoff from the northern portion of the access road that is not within the PCD catchment. Runoff will be managed in vegetated roadside swales and will discharge to the Crisps Creek catchment.
- ARC stormwater system – this system will manage stormwater runoff from the ARC and surrounding hardstand and landscaped areas. The system will include source controls to minimise stormwater contamination risks and a stormwater harvesting system that will capture stormwater runoff for use in the process water system. During the initial operating period, the system will overflow to the PCD. However, the system will be developed such that it can be integrated into a future stormwater system in the PCD catchment, that overflows to the receiving environment.
- IBA area stormwater system – this system will manage stormwater runoff from the IBA area which may be potentially contaminated. Accordingly, a stormwater capture and harvesting system is proposed that has capacity to capture all runoff during a 1% Annual Exceedance Probability (AEP) event.

A process water system will support the operation of the ARC. Operational water requirements include water for steam generation, steam conditioning, ash quenching, APCr stabilisation, operation of the FGT system, dust suppression within the IBA area and other miscellaneous uses. A process water system will be established to meet these operational water requirements and manage associated contaminated water streams.

The operation of the project will require an ongoing water supply of approximately 245 kL/day or 90 ML/year. This water will be sourced from stormwater harvesting (when available) and the Willeroo Borefield (when stormwater is not available). During drought conditions, it is anticipated that the Willeroo Borefield will meet the project’s full water supply requirements for extended periods of time.

The process water system will utilise potentially contaminated stormwater runoff captured in the IBA area stormwater system and recycled process water that could comprise a mixture of raw water, brine (from the demineralisation plant) and return water from the wash down and steam cycle systems. Under certain circumstances (such as extended wet weather) there may be surplus process water that requires management via dewatering to ED1. This contingency arrangement will ensure that all contaminated stormwater or recycled process water is managed in either the process water system or ED1, with no discharges to the stormwater system expected.

Wastewater will be generated by the ARC’s amenities. A new on-site wastewater system will be established to manage wastewater (ie sewage) produced within the ARC. The system will be designed and operated in accordance with the methods described in *Designing and Installing On-Site Wastewater Systems* (WaterNSW 2019).

4.6.3 Lighting

Permanent lighting at the ARC ensures safe operating conditions, in accordance with the Australian Standard. This lighting will be positioned downwards and away from sensitive receptors to minimise emissions and nuisance impacts to surrounding landowners and road users.

4.7 Construction

4.7.1 Duration and staging

The construction of the project is expected to be undertaken over a period of three years and will include the following stages:

- Site establishment.
- Civil works.
- Substation construction.
- ARC construction and plant installation.
- Commissioning and testing.
- Operational licensing.

Key project durations are as follows:

- 2021–2023: environmental assessment and determination.
- 2023–2025: project construction (approximately three years).
- 2026: commencement of project operation.

The construction of the project has different and overlapping stages during the approximate three year period. This is shown in Figure 4.11, with each of the different stages described in Table 4.6. It is noted that stages have been described above for the purposes of defining timeframes and durations of activities. However, the project is not a staged development consent application.

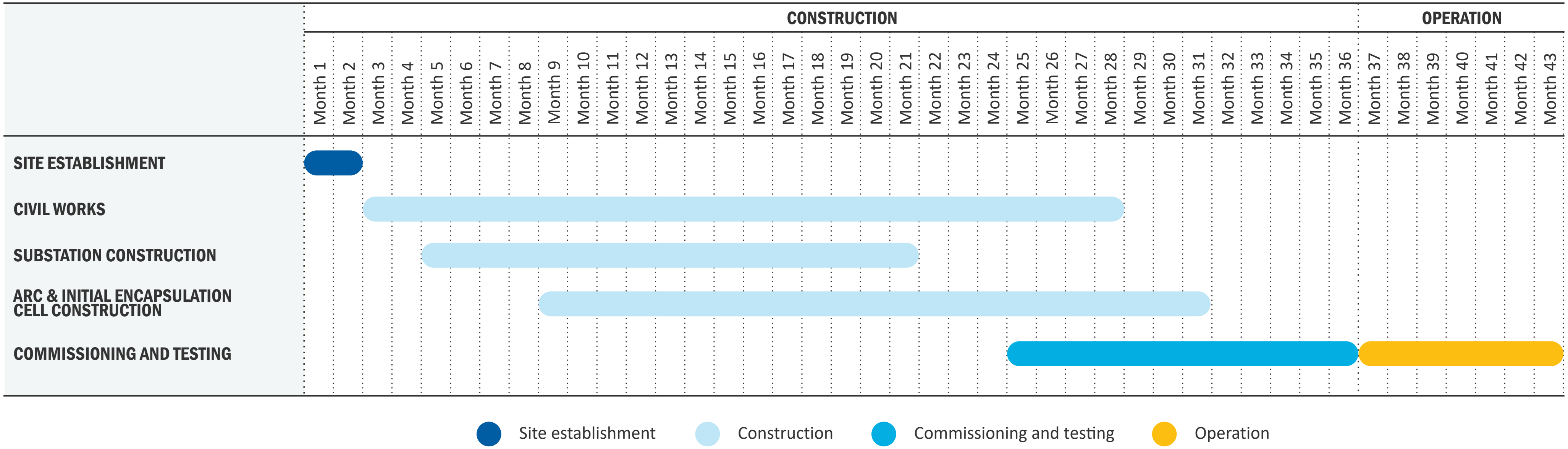

Figure 4.11 Indicative construction sequencing

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Table 4.6 Overview of construction stages and activities

Stage	Typical activities
Site establishment	The first stage of construction will be site establishment works to prepare the project for construction. Site establishment will follow well-established practices with the following indicative steps carried out: • site boundary delineation and establishment of survey; • site fencing will be erected to provide security and safety; • erection of a temporary site compound to support pre-construction activities; • erosion and sediment control measures will be installed on site. This includes mitigation around stockpile areas. Topsoil and general fill material will be stockpiles in clearly separated areas; and • vegetation clearing and grubbing.
Civil works	Civil works required to prepare the project for construction will include: • delivery of heavy machinery including plant and equipment; • earthworks will be required after the site has been established and prepared including compaction and stabilisation of the ground surface for foundations and pads for proposed structures; • after the ground surface has been prepared, footings will be excavated/piled and filled with concrete in areas where structures will require stabilisation, and concrete building pads will be poured; • fire protection systems will be constructed; • drainage establishment including construction of stormwater management structures as described in Section 4.7.4; • construct water and wastewater treatment facilities; • lines will be marked on internal roads and speed limit and other signs will be erected; and • establishment and construction of the new access road.
Substation construction	Substation construction will include feeder line augmentation, substation construction, electrical cabling works, switching equipment and connection tests.
The ARC building construction	Construction of the ARC and associated infrastructure will include: • structure/building construction; • boiler and equipment installation; • flue gas equipment installation, as well as stack construction; • fire protection equipment installation; and • auxiliary equipment and balance of plant installation including steam turbine.
The IBA area	Construction of the IBA area including: • the IBA processing building (semi-enclosed structure); • IBA maturation pad (hardstand area for stockpiling of IBA); and • infrastructure for wastewater and leachate management.
The encapsulation cell	Construction of the encapsulation area including: • initial construction and establishment; • lining and leachate management preparation; and • progressive staging and filling.
Commissioning	The commissioning process is expected to commence two years after site establishment and will involve key commissioning stages as listed in Section 4.8 and described in detail within Woodlawn ARC Commissioning – Outline Plan attached at Appendix H.
Operational Licensing	Operational licensing will involve preparing and lodging the operational environmental management plan; preparing and submitting the operational licence application; and receiving the operational licence from the EPA.
Operation	Operation will involve the commencement of export of electricity, and availability testing.

4.7.2 Construction hours and workforce

Construction activities are proposed 24 hours per day seven days per week.

The construction phase of the project is expected to require up to 300 construction personnel, the majority of which are expected to be employed from within the Goulburn region.

A breakdown of the estimated workforce and construction personnel required throughout the peak construction period is detailed in Table 4.7.

The construction workforce would utilise the existing contractor car parking at the Eco Precinct, with additional carparking able to be established in the sub-contractors area as required.

Table 4.7 Construction workforce

Workforce roles	Estimated number of personnel
Construction management and supervision:	
Construction managers	8
Site engineers	15
Technicians	15
QS	3
Site foreman	15
Administration and support	8
Structural concrete team	20
Steelwork and cladding team	25
External works:	
Drainage and pipework	10
Fencing	5
Lighting	6
Roads and earthworks	8
Access	10
Mechanical and engineering:	
Boiler installation	15
Crane gantry and waste handling	6
Grate and conveyors	10
Flue gas treatment	20
Ash handling system	10
Turbine hall	8
Administration building:	
Building work	15

Table 4.7 Construction workforce

Workforce roles	Estimated number of personnel
Internal trades	20
Electricians	20
Stores and plant management	5
General labour	20
Total estimated construction staff	**297**

4.7.3 Plant and equipment

The typical plant and equipment required for construction will include items listed in Table 4.8.

The majority of the plant and equipment will be delivered to site on rigid and semi-trailer low-loaders. Construction materials will be delivered on rigid concrete agitators, truck and dog, semi-trailer dump trucks, semi-trailer tautliner and flat top trucks. The development footprint includes a subcontractors area that will be established as a site compound and laydown area during construction. In addition, the IBA area will be used as a construction laydown and site compound if required during the construction phase.

Construction materials, infrastructure and specialised equipment will be transported to the site via the existing heavy vehicle haulage routes (refer to Section 8.5 and Appendix T).

Table 4.8 Typical construction plant and equipment

Plant type	
Trucks	Excavator
Crane 100 t	Elevated work platform
Diesel generator	Roller
Lighting tower	Front end loader
Concrete pump (3 at peak would be when the bunker is poured)	Water truck for dust suppression
Tracker boring machine	Concrete agitator
Franna	Angle grinder

4.7.4 Water management

The water management system will provide water for construction, manage water produced by construction activities, and manage surface water runoff from areas disturbed by construction.

The construction phase water management system is described separately in Section 8.7 and Appendix V for the areas that are upstream and downstream of the PCD catchment.

Water supply during construction will be supplied by the Eco Precinct's existing water supply system, which sources water from surface water storages and the Willeroo Borefield. Existing water transfer pipelines will be used to transfer water from the borefield to the ARC. A connection point will be required to connect the ARC to the existing infrastructure which will be within the ARC development footprint. The preliminary location of existing water management infrastructure is shown in Figure 4.12. The water demand during the construction phase of the project will be less than the demand for the operational phase of the project.

4.7.5 Waste generation

Recyclable materials generated during the construction stage of the project will be recycled (eg metals, paper, cardboard). Waste will be classified and disposed to an appropriately licensed facility, which may include disposal at the Bioreactor.

4.8 Commissioning

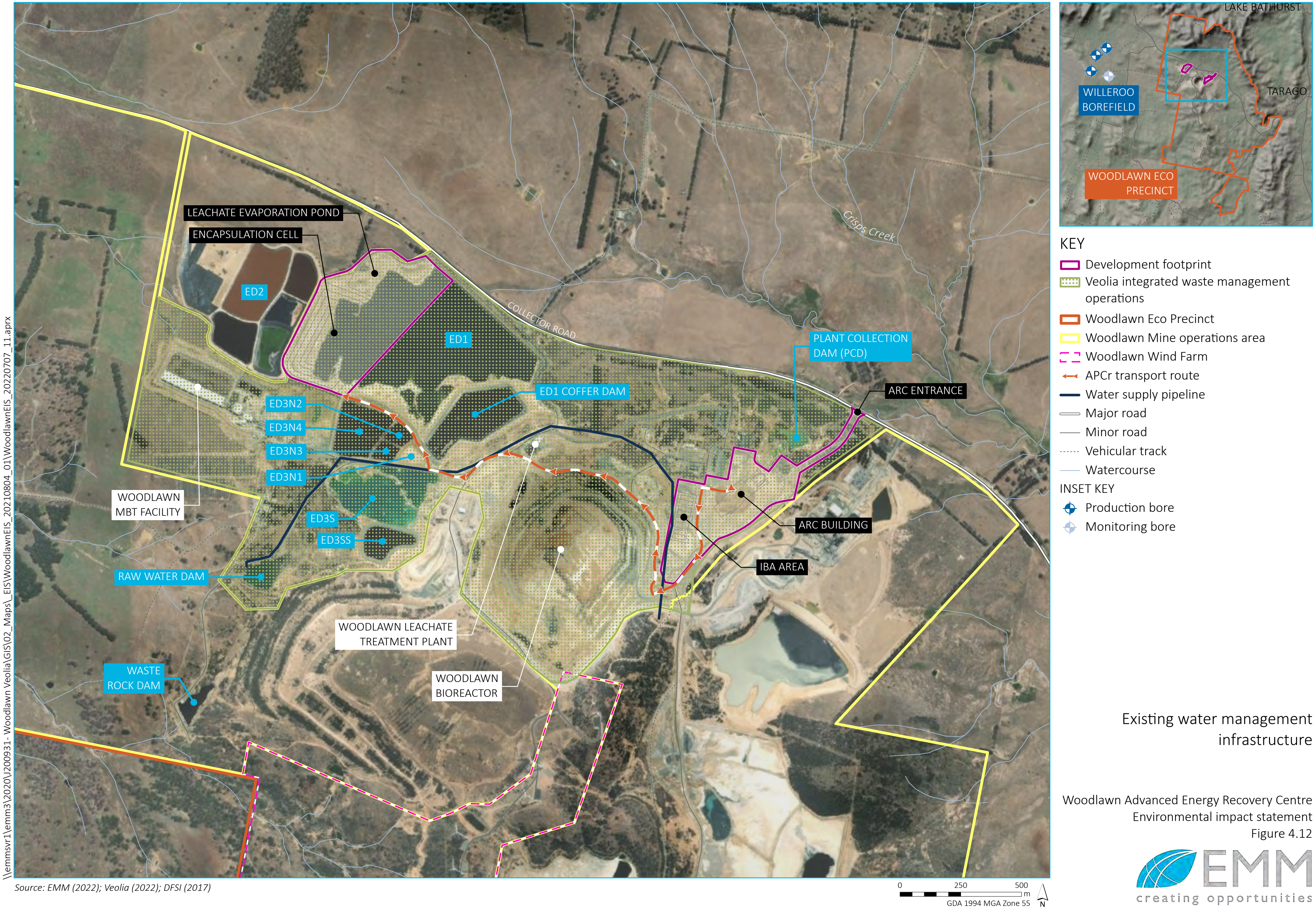
Following successful construction of the project, Veolia proposes to demonstrate that the ARC will be fit for purpose and compliant with relevant project approvals by proving via a commissioning process the:

- capacity (demonstrated processing capacity);
- emissions (demonstrated environmental compliance); and
- specification (demonstrated capability).

The commissioning process will ensure that planning, documenting, scheduling, testing, adjusting and verifying will assure that the technology and process has been designed and installed to operate as intended and will achieve Veolia's legislative and regulatory obligations under the project approvals.

Throughout the commissioning process, the works will be guided by the following:

- the European Union (EU) Industrial Emissions Directive 2010/75/EU;
- the NSW Energy from Waste Policy Statement June 2021; and
- all project approvals including consents, licences and applicable legislation and regulations.



Source: EMM (2022); Veolia (2022); DFSI (2017)

Existing water management infrastructure

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.12

EMM
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The commissioning process for the project is expected to commence two years after site establishment and will include the following key commissioning stages:

- construction completion: construction of the ARC is substantially complete and it is safe to commence pre-commissioning testing of equipment;
- pre-commissioning testing;
- commissioning testing;
- threshold performance testing;
- reliability testing;
- guaranteed performance testing;
- availability testing (8,000 hours); and
- issuing of acceptance certificate.

Details of the commissioning process are provided in the Woodlawn ARC Commissioning – Outline Plan at Appendix H.

4.9 Decommissioning

The life of the project is dependent on a range of factors, which may include future changes in waste policy and legislation, advances in technology, and availability and suitability of waste feedstock sources in the future. For the purposes of the EIS, a key element of the project, the encapsulation cell, has been based on a 25 year operational life. This is based on the assumptions and parameters described in Section 4.4.3 and assumes the maximum throughput of the ARC of up to 380,000 tpa is achieved annually. Lower annual throughputs would mean the encapsulation cell would provide storage capacity for stabilised APCr in excess of 25 years. Once capped and rehabilitated, the encapsulation cell is intended to remain in situ and will be integrated into final land use planning for the broader Eco Precinct.

Once the ARC building and ancillary infrastructure reaches the end of its operational life, its future use will be considered with the broader site rehabilitation and remediation of the Eco Precinct, as described in Section 2.4.

Decommissioning and/or future use of ARC project infrastructure and final land use planning for the encapsulation cell will be integrated into Veolia's LCRMP (Veolia, 2016), described in Section 2.4. The LCRMP outlines Veolia's approach to rehabilitation of areas generally covered under its development consents (DA 31-02-99 and MP 10_0012 as modified).

Chapter 5

Statutory context

5 Statutory context

5.1 Introduction

This chapter identifies the key relevant statutory requirements for the project having regard to the EP&A Act and EP&A Regulation, other NSW and Commonwealth legislation, and environmental planning instruments.

This section has been set out in accordance with the SSD EIS guidelines (DPIE 2021b), to cover the following:

- power to grant approval (ie approval pathway);
- permissibility;
- objects of the EP&A Act;
- other approvals;
- pre-conditions to exercising the power to grant approval; and
- mandatory matters for consideration.

Detailed consideration of relevant statutory requirements is given in the assessment sections of the EIS.

This section identifies the key statutory requirements that are relevant to the assessment and evaluation of the project only. All other relevant statutory requirements, including administrative requirements, are provided in Appendix J.

The SEARs require the EIS to address legislative and policy requirements, which are listed in Appendix A.

During the time of writing this EIS and on 2 December 2021, the DPE announced the consolidation of State Environmental Planning Policies (SEPPs) to align with 9 focus areas of the NSW planning system. Forty-five existing SEPPs were consolidated into 11 new SEPPs based on the themed-based focus areas and commenced on 1 March 2022. The consolidated SEPPs referenced within this EIS include:

- SEPP (State and Regional Development) 2011 – consolidated into the SEPP (Planning Systems) 2021.
- SEPP (Infrastructure) 2007 – consolidated into the SEPP (Transport and Infrastructure) 2021.
- SEPP (Sydney Drinking Water Catchment) 2011; SEPP (Koala Habitat Protection) 2020 and SEPP (Koala Habitat Protection) 2021 – consolidated into the SEPP (Biodiversity and Conservation) 2021.
- SEPP (Mining Petroleum Production and Extractive Industries) 2007 – consolidated into the SEPP (Resources and Energy) 2021.
- SEPP 33 (Hazardous and Offensive Development) and SEPP 55 Remediation of Land – consolidated into SEPP (Resilience and Hazards) 2021.

5.2 Approval pathway for the project

The EP&A Act defines the statutory framework for planning approval and environmental assessment in NSW. The EP&A Act is administered by the Minister for Planning and Public Spaces, statutory authorities, and local councils. Approval is sought under Part 4, Division 4.7 of the EP&A Act which relates specifically to SSD. Under Section 4.36 of the EP&A Act, a development is State significant if it is declared to be SSD by any SEPP.

The relevant SEPP which declares the development proposed by the project to be SSD is the State Environmental Planning Policy (Planning Systems) 2021. In particular, Section 2.6(1) of the SEPP (Planning Systems) states:

> (1) Development is declared to be State significant development for the purposes of the Act if-
>
> (a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and
>
> (b) the development is specified in Schedule 1 or 2.

The Project is not permissible without development consent under Part 4 of the Act as detailed in Section 5.3.

The project is a type of development specified in Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021, namely it meets the definition of both 'Electricity generating works and heat or co-generation' (Section 20) and 'waste and resource management facilities' (Section 23) under Schedule 1.

Section 20 defines development for the purposes of electricity generating works and heat or co-generation, namely:

> 20 Electricity generating works and heat or co-generation
>
> Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that—
>
> (a) has a capital investment value of more than $30 million…

The project will generate up to 30 MW of electricity and has a capital investment value greater than $30 million.

Section 23 defines development for the purposes of waste and resource management facilities:

> 23 Waste and resource management facilities
>
> …
>
> (3) Development for the purpose of resource recovery or recycling facilities that handle more than 100,000 tonnes per year of waste.
>
> (4) Development for the purpose of waste incineration that handles more than 1,000 tonnes per year of waste.

The project is for the purposes of resource recovery, involves the incineration of waste and will handle approximately 380,000 tpa of waste through the plant.

Therefore, the project is SSD and approval is sought under Part 4, Division 4.7 of the EP&A Act. The consent authority for SSD is either the Minister for Planning and Public Spaces or the Independent Planning Commission.

An application for an SSD project must be accompanied by an EIS prepared in accordance with the EP&A Regulation and the Secretary's Environmental Assessment Requirements (SEARs) for the project.

5.3 Permissibility

Section 2.6(1a) of the SEPP (Planning Systems) requires that for a project to be designated SSD it must be development that is not permissible without consent under Part 4 of the EP&A Act, by virtue of an environmental planning instrument. This introduces the permissibility test which is addressed in this section. The relevant environmental planning instrument is the *Goulburn Mulwaree Local Environmental Plan 2009* (GM LEP).

The project is located on land zoned IN3 Heavy Industrial under the GM LEP as shown on Figure 5.1. The objectives of this zone are as follows:

- to provide suitable areas for those industries that need to be separated from other land uses;
- to encourage employment opportunities;
- to minimise any adverse effect of heavy industry on other land uses;
- to support and protect industrial land for industrial uses; and
- to recognise and provide for the diverse demands and implications of industry, warehousing, transport and servicing activities and ancillary land uses.

The project is best characterised as a 'waste or resource management facility' which is defined under the GM LEP as:

> waste or resource management facility means any of the following—
>
> (a) a resource recovery facility,
>
> (b) a waste disposal facility,
>
> (c) a waste or resource transfer station,
>
> (d) a building or place that is a combination of any of the things referred to in paragraphs (a)–(c).

The following definition in the GM LEP is also relevant to the project:

> **waste disposal facility** means a building or place used for the disposal of waste by landfill, incineration or other means, including such works or activities as recycling, resource recovery and other resource management activities, energy generation from gases, leachate management, odour control and the winning of extractive material to generate a void for disposal of waste or to cover waste after its disposal.

An alternate characterisation would be as "electricity generating works" which is defined under the LEP as follows:

> **electricity generating works** means a building or place used for the purpose of making or generating electricity, or electricity storage.

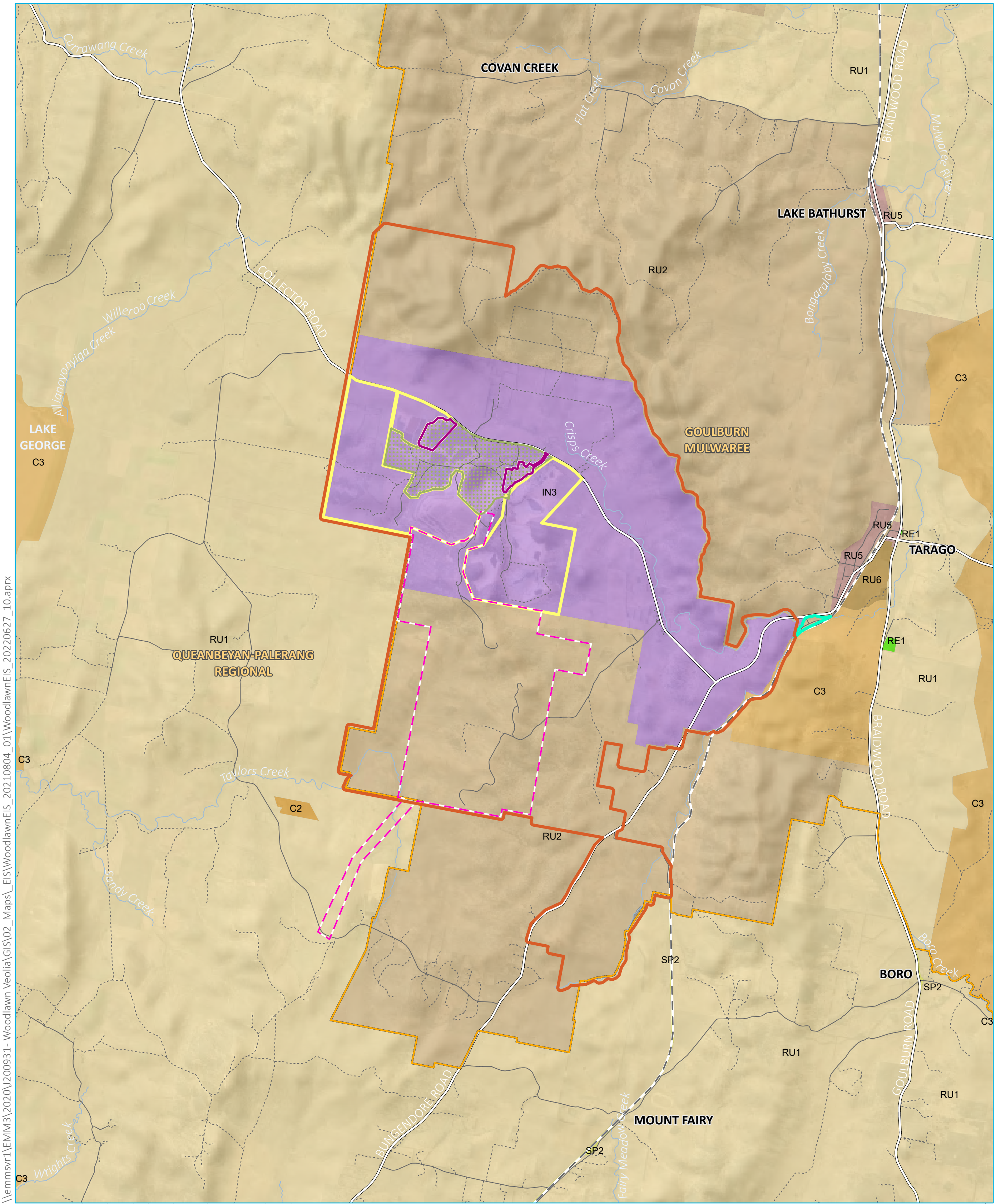
Development for the purposes of both a waste or resource management facility or electricity generating works are permissible with development consent in the IN3 heavy industrial zone under the GM LEP.

In addition to being permissible development under the GM LEP, Section 2.36 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) permits electricity generating works on any land in the IN3 zone.

Furthermore, Section 2.152(1) of the Transport and Infrastructure SEPP also permits development for the purpose of waste or resource management facilities, other than a waste or resource transfer station, within the IN3 zone.

Therefore, the project is permissible with development consent under both the Transport and Infrastructure SEPP and the GM LEP.

The development is likely to be subject to the Goulburn Mulwaree Local Infrastructure Contributions Plan 2021, or alternatively under a Voluntary Planning Agreement (VPA). Veolia is currently in discussions with Goulburn Mulwaree Council about contributions required for the project.



Source: EMM (2022); Veolia (2022); DPIE (2020); DFSI (2017)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse
- Local government area

Land zoning

- C2 Environmental management
- C3 Environmental management
- IN3 Heavy Industrial
- RE1 Public Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- RU5 Village
- RU6 Transition
- SP2 Infrastructure

Land use zoning

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 5.1

EMM
creating opportunities

5.4 Objects of the Act

The objects of the EP&A Act are specified in Section 1.3 of the Act and seek to promote the management and conservation of natural and artificial resources, while also permitting appropriate development to occur. The consistency of the project with the objects of the Act is considered in Table 5.1.

Table 5.1 Objectives of the EP&A Act

Objective	Consistency of the project
1. To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The project provides for a more sustainable form of waste management, and the generation of low carbon energy, both of which are supported by NSW Government policies. In addition this EIS is supported by technical specialists who have been engaged to assess and report on the potential for the project to impact upon the natural and artificial resources of the project. The impacts on the natural environment have been summarised in Chapter 8.
2. To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	This EIS describes the economic, environmental and social context of the project and the potential impacts to allow informed consideration of these aspects in determining the application. The project provides for a more sustainable form of waste management, and the generation of low carbon energy, both of which are supported by NSW Government policies. The project is consistent with the principles of ecological sustainable development (ESD) as described in Chapter 9.
3. To promote the orderly and economic use and development of land.	The orderly and economic use of land is best served by development, which is permissible under the relevant planning regime and predominately in accordance with the prevailing planning controls. The project comprises a permissible development, which is consistent with the statutory and strategic planning controls, and is on a site identified by the NSW Government as an Energy from Waste Priority Infrastructure Area. As detailed in this EIS, the project will result in positive economic impacts, with appropriate mitigation measures and management strategies being proposed to reduce any adverse environmental and social impacts.
4. To promote the delivery and maintenance of affordable housing.	Not applicable to the project.
5. To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The project has been designed to minimise additional adverse impacts to biodiversity by restricting development to previously disturbed areas and by redesigning the project to avoid the placement of the ARC access road through wetland areas, avoiding the potential impacts on threatened for species (refer Section 8.10.4). The project will result in the following direct impacts to threatened biodiversity: • clearing of 1.55 ha of native vegetation in the development footprint; • loss of fauna habitat associated with native and exotic vegetation clearing; and • increased fragmentation of vegetation remnants. Wherever possible, direct impacts have been avoided and/or minimised through the design of the development footprint. Indirect impacts will be managed and mitigated through the implementation of the biodiversity management measures detailed in Section 8.10 and Appendix Y. Given the highly modified condition of all native vegetation and habitat affected by the project and the planned implementation of mitigation measures, indirect impacts on biodiversity would be negligible. Residual impacts will be compensated through implementation of the biodiversity offset scheme (BOS). The potential impacts of the project on biodiversity have been addressed and summarised in Section 8.10.

Table 5.1 Objectives of the EP&A Act

Objective	Consistency of the project
6. To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The project would not impact upon built or cultural heritage values as described in Section 8.11 and 8.12.
7. To promote good design and amenity of the built environment.	Potential air quality, human health, noise and visual impacts on sensitive receivers and the broader community, have been fully assessed and described in Section 8.1, 8.2, 8.4 and 8.13. The design of the project has been developed to respond to its environment. The design report is included in Appendix C. Design changes have occurred to avoid impacts in the first instance and management measures proposed to minimise and mitigate residual impacts.
8. To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Over the life of the project infrastructure will be maintained, or upgraded, to ensure safe and efficient operations. All construction associated with the project would be compliant with the Building Code of Australia and all other relevant statutory requirements.
9. To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	As outlined in this chapter, the project is subject to the provisions of Part 4 of the EP&A Act, and the Minister for Planning and Public Spaces or IPC will be the consent authority. Despite this, Council, as local government authority, has been regularly consulted throughout the planning phases of the project and preparation of this EIS (refer to Chapter 7). As such, it is deemed that both local and State levels of government have been provided with sufficient opportunities to share in responsible environmental planning of the project.
10. To provide increased opportunity for community participation in environmental planning and assessment.	As described in Chapter 7 and Section 8.14, there have been a range of engagement activities to inform the community about the project and to seek community (and other stakeholders) feedback. This EIS provides further detailed information regarding the project and its potential impacts. It will be placed on public exhibition by DPE, and community members will be able to make formal submissions. A report will be prepared responding to these submissions.

5.5 Other approvals

This section identifies the other approvals that are required to carry out the project and explains why they are required. These approvals are outlined in Table 5.2 and have been grouped into the following categories:

- *consistent approvals*: which are approvals that cannot be refused and are required to be issued consistently under Section 4.42 of the EP&A Act if the project is approved;
- *other approvals*: approvals that are not expressly integrated into the SSD assessment process; and
- *approvals not required*: approvals that would have been required if the project was not SSD as per Section 4.41 of the Act.

Table 5.2 Approvals and licenses required

Approval	Requirement
Consistent approvals	
An environment protection licence (EPL) in accordance with the NSW *Protection of the Environment Operations Act 1997* (POEO Act)	Under Section 48 of the POEO Act an EPL will be required for the project as it is a premise-based activity listed in Schedule 1 of the Act.
Approval under Section 138 of the *Roads Act 1993* (Roads Act)	Approval will be required under Section 138 of the Roads Act from the Council for works in, on or over a public road, or to connect a road to a classified road.
Other approvals	
Water access licence	A water access licence under the *Water Management Act 2000* (WM Act) is required to extract groundwater. Veolia currently has a Water Access Licence (WAL) for 600 ML (WAL 28983) linked to four existing production bores (the Willeroo borefield), and no additional requirements are anticipated for the project.
Approvals not required under Section 4.41	
	No approvals listed under Section 4.41 would have been required if the project was not SSD.

5.6 Pre-conditions to approvals

Pre-conditions to exercising the power to grant approval for the project are provided in Table 5.3.

Table 5.3 Preconditions to being able to grant approval for the project

Statutory reference	Pre-condition	Relevance	Section in EIS/Appendix
State Environmental Planning Policy (Biodiversity and Conservation) 2021, Chapter 8, Section 8.7 and 8.8	1. A consent authority must not grant consent to the carrying out of development under Part 4 of the Act on land in the Sydney drinking water catchment unless it is satisfied that the carrying out of the proposed development would have a neutral or beneficial effect on water quality. 2. For the purposes of determining whether the carrying out of the proposed development on land in the Sydney drinking water catchment would have a neutral or beneficial effect on water quality, the consent authority must, if the proposed development is one to which the NorBE Tool applies, undertake an assessment using that Tool.	The project is located within the Sydney drinking water catchment. The Eco Precinct is located within the Sydney Drinking Water Catchment, meaning Section 8.7(1), 8.7(2) and 8.8(1) of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (the SEPP) apply. This means the project is required to have a Neutral or Beneficial Effect (NorBE) on water quality released or migrating from site. A NorBE assessment is detailed in the Surface Water Assessment (Appendix V).	8.7 Surface water and Appendix V
State Environmental Resilience and Hazards) 2021, Section 4.6(1)	A consent authority must not consent to the carrying out of any development on land unless, if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out.	Contamination has been identified within the site and will be rehabilitated under the existing development consent.	8.8 Contamination and Appendix W

Table 5.3 Preconditions to being able to grant approval for the project

Statutory reference	Pre-condition	Relevance	Section in EIS/Appendix
State Environmental Planning Policy (Resilience and Hazards) 2021	In accordance with Section 3.7, consideration of Departmental guidelines in determining whether a development is— a) a hazardous storage establishment, hazardous industry or other potentially hazardous industry, or b) an offensive storage establishment, offensive industry or other potentially offensive industry, Consideration must be given to current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development.	The preliminary hazards assessment (PHA) found that the project meets the definition of a potentially hazardous industry. Accordingly the PHA involved a SEPP 33 screening assessment.	8.16 Hazards Appendix EE (PHA)
Goulburn Mulwaree Local Environmental Plan 2009, Clause 7(2) Terrestrial Biodiversity	4. Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development is consistent with the objectives of this clause and— a) the development is designed, sited and managed to avoid the potential adverse environmental impact, or b) if a potential adverse impact cannot be avoided, the development— i. is designed and sited so as to have minimum adverse impact, and ii. incorporates effective measures so as to have minimal adverse impact, and iii. mitigates any residual adverse impact through the restoration of any existing disturbed or modified area on the site.	Biodiversity impacts due to the project are not significant and have been minimised during design of the project. Potential impacts will be managed through the implementation of management measures, and offsetting for residual impacts that cannot be avoided.	8.10 Biodiversity Appendix Y (BDAR)

5.7 Mandatory matters for consideration

The mandatory conditions that must be satisfied before the consent authority may grant approval to the project are listed in Table 5.4.

Table 5.4 Mandatory consideration for the project

Statutory document	Section reference	Mandatory consideration	Section/Chapter in EIS/Appendix
Considerations under the EP&A Act and Regulation			
Environmental Planning and Assessment Act 1979 (EP&A Act)	Section 1.3	Relevant objects of the Act	5.4 Objects of the Act
	Section 4.15(1)	The provisions of any relevant environmental planning instruments (as outlined in Section 5.1 of this EIS, SEPP consolidation commenced 1 March 2022. Acts have not yet been updated to reflect SEPP consolidation, however the list below has been consolidated): • State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP); • State Environmental Planning Policy (Planning Systems) 2021; • State Environmental Planning Policy (Biodiversity and Conservation) 2021; • State Environmental Planning Policy (Resources and Energy) 2021; and • State Environmental Planning Policy (Resilience and Hazards) 2021.	5 Statutory context Appendix J (Statutory compliance table)
		The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	8 Assessment of impacts
		The suitability of the site for the development.	3.4 Site suitability
		The public interest.	7 Engagement

Table 5.4 Mandatory consideration for the project

Statutory document	Section reference	Mandatory consideration	Section/Chapter in EIS/Appendix
Mandatory relevant considerations under EPIs			
State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP)	Section 2.48	Development likely to affect an electricity transmission or distribution network • The consent authority must give written note to the electricity supply authority for the area in which the development is to be carried out, inviting comments about potential safety risks, and must take into consideration responses received within 21 days. • The clause applies to a development application including development carried out within or immediately adjacent to an easement for electricity purposes (whether or not the electricity infrastructure is existing), or immediately adjacent to an electricity substation, or within 5 m of an exposed overhead electricity power line. There is electricity infrastructure within the vicinity of the development footprint. Essential Energy is the relevant electricity supply authority. The project will require connection to an electricity distribution network.	5 Statutory context
	Section 2.121(3)	Traffic generating development: • Consider any response received from TfNSW. • Consider the accessibility of the site. • Consider any potential traffic safety, road congestion or parking implications of the development. The project is classified as traffic generating development in accordance with Section 2.121 and Schedule 3 as it involves a waste or resource management facility. The project has been referred to TfNSW and relevant consultation is discussed in Chapter 7.	7 Engagement Section 8.5 Traffic and transport
	Section 2.152(1)	Section 2.152(1) of the Transport and Infrastructure SEPP also permits development for the purpose of waste or resource management facilities, other than a waste or resource transfer station, within the IN3 zone. Therefore, the project is permissible with development consent under the Transport and Infrastructure SEPP	5 Statutory context
State Environmental Planning Policy (Planning Systems) 2021	Schedule 1, Section 20	The project is SSD as it is in an ERF (ie 'electricity generating works and heat or co-generation') with a CIV of more than $30 million for the purposes of section 20 of Schedule 1 of the SEPP (Planning Systems).	5.3 Permissibility
	Schedule 1, Section 23	The project is SSD as it is a 'waste and resource management facility' for the purpose of handling more than 100,000 tpa of waste for the purpose of section 20 of Schedule 1 of the SEPP (Planning Systems).	5.3 Permissibility

Table 5.4 Mandatory consideration for the project

Statutory document	Section reference	Mandatory consideration	Section/Chapter in EIS/Appendix
State Environmental Planning Policy (Resources and Energy) 2021	Section 2.19	Compatibility of proposed development with mining, petroleum production or extractive industry • Consider whether or not the development is likely to have a significant impact on, or be incompatible with, current or future extraction or recovery of minerals, petroleum or extractive materials (including by limiting access to, or impeding assessment of, those resources). • Evaluate and compare the respective public benefits of the development and the uses, extraction and recovery referred to above, and evaluate any measures proposed by the applicant to avoid or minimise any incompatibility. The project is located immediately adjacent to a mining operation including both surface and underground mining operations. The project will not impact on existing mining operations.	2 Existing operations
State Environmental Planning Policy (Resilience and Hazards) 2021	Section 3.7	Consider departmental guidelines in determining whether a development is: • a hazardous storage establishment, hazardous industry or other potentially hazardous industry; or • an offensive storage establishment, offensive industry or other potentially offensive industry. Consideration must be given to current circulars or guidelines published by the Department of Planning and Environment relating to hazardous or offensive development.	8.16 Hazards Appendix EE (PHA)
	Section 3.12	Potentially hazardous development • Whether any public authority should be consulted. • A preliminary hazard analysis. • Any feasible alternatives. • Any likely future land use of surrounding land.	8.16 Hazards Appendix EE (PHA)
State Environmental Planning Policy (Resilience and Hazards) 2021	Section 4.6(1)	Remediation of land – consider whether the land is contaminated.	8.8 Contamination Appendix W (Preliminary site investigation)
	Section 4.6(2)	Remediation of land – consider a report specifying the findings of a preliminary investigation of the land.	8.8 Contamination Appendix W (Preliminary site investigation)

Table 5.4 Mandatory consideration for the project

Statutory document	Section reference	Mandatory consideration	Section/Chapter in EIS/Appendix
State Environmental Planning Policy (Biodiversity and Conservation) 2021	Chapter 8	Sydney Drinking Water Catchment – Water NSW's current recommended practices and standards. Development consent cannot be granted unless neutral or beneficial effect on water quality	8.6 Groundwater 8.7 Surface water Appendix U (GWIA) Appendix V (SWIA) Appendix J (Statutory compliance table)
State Environmental Planning Policy (Biodiversity and Conservation) 2021	Chapter 3 and Chapter 4	Koala protection – consider within the biodiversity development assessment report	Appendix Y (BDAR)
Goulburn Mulwaree Local Environmental Plan 2009	Clause 2.3(2)	Zone objectives – IN3 Heavy Industrial • Clause 7.1A Earthworks. • Clause 7.2 Terrestrial biodiversity.	5.3 Permissibility 8 Assessment of Impacts 8.10 Biodiversity Appendix J (Statutory compliance table) Appendix Y (BDAR)
Considerations under other legislation			
Biodiversity Conservation Act 2016	Section 7.14	The likely impact of the proposed development on biodiversity values as assessed in the biodiversity development assessment report. The Minister for Planning may (but is not required to) further consider under that Act the likely impact of the proposed development on biodiversity values.	8.10 Biodiversity Appendix J (Statutory compliance table) Appendix Y (BDAR)

Chapter 6

Application of NSW EfW Policy

6 Application of NSW EfW Policy

This chapter provides additional information about the proposed EfW technology, its feedstock and its compliance with the NSW EfW Policy Statement.

6.1 Introduction

The NSW EfW Policy Statement was updated and rereleased in June 2021 and is now supported by the *Energy from Waste Infrastructure Plan* (EPA 2021b) (the EfW Infrastructure Plan) and the *Guide to the NSW Energy from Waste Framework* (EPA 2021c) (the EfW Framework).

As noted in Section 3.1.3 of this EIS, the EfW Policy Statement sets out a series of criteria for the establishment of EfW or ERFs in NSW. The purpose of this chapter is to assess the compliance of the ARC project against the criteria set out in that policy.

The policy is structured to deal with “eligible fuels” in Section 3 and any other waste or waste derived fuels that are not defined as eligible fuels in Section 4. This project falls into Section 4 by virtue of the feedstock that is proposed. The following subsections review the project against each the criteria set out in the EfW Policy Statement.

6.2 Public consultation and good neighbour principle

The EfW Policy Statement notes that it is “essential that proponents provide effective information and public consultation about EfW proposals. As proposals progress from the concept to the detailed development assessment stage, proponents should engage in a genuine dialogue with the community and ensure that planning consent and other approval authorities are provided with accurate and reliable information” (p.3).

The Policy also notes that operators need to be “good neighbours”, and this would apply to waste deliveries and operating hours, “but most importantly with respect to readily available information about emissions and resource recovery outcomes” (p.3).

As discussed previously, the project site is more than 4 km away from any privately owned neighbouring houses, and approximately 6 km from the village of Tarago. Veolia has engaged extensively with the community about the project, as detailed in Chapter 7 and in Appendix K, which set out both the process for consultation and the outcomes. Furthermore, an independent Social Impact Assessment (SIA) has been carried out in accordance with the DPE guidelines, and it is reported in Section 8.14 and Appendix CC. The SIA has identified a degree of concern amongst some community members, focused on the current operations at the Eco Precinct and their impacts, notably odour. Veolia has recognised these issues and has committed to further investigations into odour management at the Eco Precinct. It is noted that the ARC project is not anticipated to create additional odour.

Veolia has a long history of working with the community in the vicinity of Tarago, since the establishment of the Eco Precinct some 20 years ago. This long history of community engagement is detailed in Chapter 7. Finally, Veolia will make validated emission monitoring data available publicly within 24 hours following the end of a weekday and the following weekday after weekends and public holidays. This commitment is detailed in Section 8.1.4.

6.3 Reference facility

The EfW Policy Statement establishes the notion of a "reference facility" noting that ERFs must use "technologies that are proven, well understood and capable of handling the expected variability and type of waste feedstock. This must be demonstrated through reference to fully operational plants using same technologies and treating like waste streams in other similar jurisdictions" (p.5).

The key reference facility used to support this project is Veolia's W2R Staffordshire ERF (also known as the Four Ashes facility), which opened in May 2014 (https://www.veolia.co.uk/staffordshire/our-facility/energy-recovery-facility). This is principally used as the reference facility for the purposes of the air quality and noise impact assessments, but also supports other assessments, including the ash management study (Appendix E). A number of additional ERF's are referenced in other sections of this assessment, including the BAT assessment (Appendix L(ii)) and the ash management study in relation to the management of the IBA and APCr (Appendix E).

The Staffordshire ERF is located on the edge of the Four Ashes Industrial Estate in Wolverhampton, Staffordshire. It is located approximately 1,100 m from the village of Calf Heath, a rural village, as shown on Figure 6.1. One of the reasons that Staffordshire ERF was selected as the reference facility was that residents in the vicinity of the Eco Precinct requested a similar plant in a rural setting.

The Staffordshire ERF gained planning approval in February 2011 for construction and operation of an energy recovery facility (ERF) to manage approximately 300,000 tonnes of waste per year, including administrative and visitor facilities, gatehouse and weighbridge, vehicle parking and circulation areas, security fencing and other ancillary structures together with site drainage and landscape works at The Dell, Enterprise Drive, Four Ashes, Wolverhampton (Veolia, Planning Application – Variation of planning condition 1 od SS.11/16/636 to increase permitted throughput of the facility. December 2014). Copies of relevant permits are included as attachments to Appendix L(ii).

Construction commenced in June 2011 and the site became fully operational in March 2014. Veolia sought and was granted approval to increase the throughput to 340,000 tpa in 2015.

The Staffordshire ERF uses the same technology as proposed for the ARC comprising:

- an enclosed waste receival hall where vehicles unload into a waste bunker;
- a feed hopper which feeds the waste on to a moving grate;
- a chamber where combustion occurs;
- a steam boiler and turbo generator set; and
- a FGT system comprising:
  - injection of hydrated lime for acid gas control;
  - NOx control through selective non catalytic reduction (SNCR) using liquid ammonia;
  - injection of activated carbon;
  - filter bags for the control of APCr; and
  - a continuous emissions monitoring system (CEMS).

Table 6.1 Comparison of the Staffordshire ERF reference facility with the proposed ARC

Parameter	Description	Unit	Reference Plant - Four Ashes ERF, Staffordshire, UK	Proposed ARC
Feedstock	• C&I and MSW expressed as C&I:MSW	%	C&I – 18% MSW – 82 %	C&I – 20% MSW – 80 %
Combustion	• Combustion Technology		Moving grate	Moving grate
	• Number of Lines		2	1
	• Nominal Waste Capacity	t/h	40 (2 x 20)	43.8
	• NCV at MCR	kJ/kg	9,200	9,000
	• Auxiliary Burner Fuel		Fuel Oil	Fuel Oil
Boiler	• Steam Type		Superheated	Superheated
	• Number of Boilers		2	1
Flue Gas Treatment	**NOx Control**			
	• Type		SNCR	SNCR
	• Reagent		25% Ammonia	25% Ammonia
	• Flue Gas Recirculation		No	To be confirmed during detailed design.
	Acid Gas Control			
	• Type		Dry	Semi dry
	• Reagent		CaOH2	CaOH2
	Heavy Metals/Complex Organics			
	• Reagent		Activated Carbon	Activated Carbon
	Filtration			
	• Type		Fabric Filter	Fabric Filter
Continuous Emissions Monitoring	• Number of Analysers		1 duty for each line and 1 standby (ie 100% redundancy)	1 duty and 1 standby (ie 100% redundancy)
Energy Recovery	**Electricity**			
	• Number of Turbines		1	1
	• Gross Power Output (at MCR)	MWe	26	30.7
	• Steam	MWt	Nil (potential to use heat via steam offtake)	Nil (potential to use heat via steam offtake)

This arrangement is the same as proposed for the ARC, although the Staffordshire ERF operates two processing lines for its 340,000 tpa capacity, whereas the ARC is proposed as a single line processing up to 380,000 tpa. The Staffordshire plant is engineered such that one line is always available (with the exception of planned shutdowns). Two lines are not required for the ARC as the Bioreactor landfill is available to accept waste should the ARC be shut down for maintenance or other reasons. A more detailed comparison of the reference facility with the ARC project is contained in the BAT (Best Available Techniques) Assessment and the Reference Facility Review both in Appendix L.

In terms of feedstock, a comparative analysis of the feedstock at Staffordshire ERF with that proposed for the ARC is presented in Table 6.2. Waste feedstock, particularly MSW varies globally and regionally due to climate, demographics, housing forms (houses or apartments), and a range of regulatory, cultural and socio-economic factors. Table 6.1 notes that the Staffordshire plant accepts 82% MSW and 18% C&I, whilst the proportions proposed for the ARC are approximately 80% and 20%, respectively. Table 6.2 provides data from waste audits performed at Staffordshire and at Veolia's two transfer terminals in Sydney. Both were undertaken prior to final quality control on the waste stream to make it suitable for an ERF. The results indicate that the feedstock constituents are very similar, with one key difference being the proportion of organics, which is expected to be higher at the ARC until the NSW Government's mandated move toward source separation of food organics and garden organics (FOGO) comes into force by 2030.

Further operational data from the Staffordshire plant can be found in Appendix GG. More detail on the expected composition of the feedstock for the ARC can be found in Section 6.5.4 of this EIS.

It can be seen that the Staffordshire ERF meets the EfW Policy Statement criteria of same technology and like waste and is therefore a suitable reference plant for the ARC. This conclusion is supported by reviews undertaken by two European engineering houses with extensive EfW experience. The reports from Ricardo and Fichtner are included at Appendix L.

Table 6.2 Input waste feedstock composition summary

Plant		Woodlawn[2]		Staffordshire[3]
Category	**MSW**	**C&I**	**Average input**	**Average input**
Organics	39.9%	38.3%	39.6%	25.0%
Paper/cardboard	15.6%	20.3%	16.5%	24.1%
Textiles	7.7%	5.3%	7.2%	9.5%
Nappies/hygiene	7.8%	2.1%	6.7%	5.3%
Plastics	15.8%	16.9%	16.0%	17.9%
Combustible material	1.2%	3.0%	1.6%	3.4%
Glass	1.5%	3.5%	1.9%	1.8%
Metals	1.7%	1.9%	1.7%	3.4%
Non-combustible/inert	0.3%	3.3%	0.9%	2.7%
E-waste	0.8%	1.8%	1.0%	1.3%
Other hazardous	0.9%	0.7%	0.9%	0.5%
Other	6.7%	3.0%	6.0%	5.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

2 Woodlawn average input composition based on 80% MSW and 20% C&I from Banksmeadow audit

3 Staffordshire average input composition provided as the average of combined MSW and C&I data

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Source: EMM (2021); VEOLIA (2021); DFSI (2017)

KEY

- Major road
- Minor road
- Vehicular track

Veolia W2R Staffordshire
Energy Recovery Facility

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 6.1

EMM
creating opportunities

6.4 Technical criteria

The EfW Policy Statement contains a set of technical criteria. For many of these compliances will be achieved through the design specification process. Table 6.3 notes how each of the criteria will be met.

Table 6.3 Technical criteria compliance

Criterion	Compliance
Plant design and operation	
The EPA will set operating conditions in environment protection licences for all approved energy recovery facilities.	The proposed Woodlawn ARC will comply with the operating conditions set by the EPA in the environment protection license.
Meet 850°C for at least 2 seconds in the combustion chamber (equivalent to the European Waste Incineration Directive) or 1,100°C for 2 seconds if the waste contains more than 1% of halogenated organic substances, expressed as chlorine.	The proposed plant will be designed to achieve 850°C with a residence time of 2 seconds. The selected feedstock will have a chlorine content less than 1% based on its waste composition. Waste acceptance procedures will be in place to ensure compliance with this threshold (Appendix G). An analysis of the chlorine content of the ARC feedstock can be found in Appendix I.
Total organic carbon (TOC) or loss on ignition (LOI) content of the slag and bottom ashes must not be greater than 3% or 5% (dry weight) respectively.	The proposed plant will be designed so the TOC or LOI content of the slag and bottom ashes is not greater than 3% or 5% (dry weight) respectively. Data on the TOC content of the bottom ash at Staffordshire ERF can be found in Appendix GG.
Waste feed interlocks are required to prevent waste from being fed to the facility when the required temperature has not been reached either at start-up or during operation.	The proposed plant will be designed to include waste feed interlocks to prevent feeding when the required temperature has not been reached. Auxiliary burner(s) in the boiler ensure that the required temperatures are met and serve as a prerequisite to feeding waste.
Waste streams proposed for energy recovery should not contain contaminants such as batteries, light bulbs or other electrical or hazardous wastes.	Quality control is undertaken as the waste is being processed for resource recovery at each Waste Transfer Terminal (WTT). The residual waste is inspected as far as practicable, and any identified non-conforming waste is removed from the Woodlawn ARC waste stream. Non-conforming waste will be aggregated in a designated isolation area for further processing as required. The Woodlawn ARC will be designed to receive all reasonably acceptable waste typically arising from residual MSW and C&I waste streams that are in accordance with relevant policies surrounding acceptance criteria. In practice, due to the heterogeneous nature of waste, there is potential for minor quantities of non-conforming waste to inadvertently be accepted into the ARC. The equipment design is consistent with the best available techniques and is capable of treating minor quantities of non-conforming waste.
Emissions standards	
Energy recovery facilities must be designed and operated to ensure they achieve air emissions no greater than the standards prescribed in Table 1 of the NSW Energy from Waste Policy Statement.	The proposed plant will be designed to achieve the emissions limits during normal operating conditions. A management plan will be developed for the control of emissions during OTNOC, start-up and shut down, accompanied by monitoring and reporting.
There must be continuous measurements of the operational parameters listed in Table 2 of the NSW Energy from Waste Policy Statement. This process monitoring data must be held by the proponent for a period of three years.	The proposed plant will be designed to conduct continuous measurements of the operational parameters. The data will be held for a minimum period of three years.

Table 6.3 Technical criteria compliance

Criterion	Compliance
Proof of performance	
The EPA will require Operators to complete proof of performance (POP) testing to demonstrate compliance with air emissions standards. Proponents must provide a commissioning plan during the EPL application stage, detailing the POP mission testing that will be undertaken.	Section 4.8 provides an overview of the commissioning process, with further detail on the key stages of the process at Appendix H. Appendix H sets out the standard commissioning processes that demonstrate confidence in the monitoring equipment proposed.
Emissions monitoring	
Undertake ongoing monitoring to demonstrate compliance with air emission standards. The minimum emissions monitoring requirements are listed in Table 3 of the NSW Energy from Waste Policy Statement.	The proposed plant will be designed so continuous monitoring of the flue gas at the stack will be available within the Continuous Emissions Monitoring System (CEMS). For substances where monitoring cannot occur continuously, monitoring will occur quarterly, and the results published publicly. Ammonia monitoring shall be continuous unless otherwise agreed with the EPA. Monitoring frequency shall comply with the requirements listed in Table 3.
Emissions reporting	
To the extent practicable validated emission monitoring data must be made available publicly through an online portal in near real time.	The validated emission monitoring data will be made available publicly within 24 hours following the end of a weekday and the following weekday after weekends and public holidays.
Emission monitoring data must be made available to the EPA in real time graphical publication and a weekly summary of continuous monitoring data and compliance with emissions limits published on the internet.	Emission monitoring data will be made available to the EPA in real time graphical publication. A weekly summary of continuous monitoring data and compliance with emissions limits will be made available to the EPA.
Air emission modelling assessment	
Air quality impact assessment must be undertaken in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.	An Air Quality Impact Assessment (AQIA) has been carried out for the facility and is included at Appendix O.
Thermal efficiency criteria	
Plants that do not recover energy are outside the scope of the Policy.	Steam will be produced and electricity will be generated for export by the facility and therefore the proposed plant meets this requirement.
Facilities must demonstrate that at least 25% of the energy generated from the thermal treatment of the material will be captured as electricity (or an equivalent level of recovery for facilities generating heat alone).	The proposed plant will be designed to achieve a minimum of 25% energy recovery to electricity or its equivalent in heat output.
Facilities must demonstrate that any heat generated by the thermal processing of waste is recovered as far as practicable.	The proposed plant will be designed to recover heat generated by the thermal processing of waste as far as practicable. The steam turbine will be fitted with a medium pressure (typically 10–12 barg) extraction point for operation in a combined heat and power (CHP) mode, should suitable offtaker(s) be identified. The maximum heat output would be approximately 70 MWth.

6.5 Resource recovery criteria

6.5.1 Introduction

The resource recovery criteria in the EfW Policy Statement define the proportion of waste or waste-derived materials that can be combusted under different collection scenarios, in alignment with the waste hierarchy. These criteria are designed to ensure that EfW is only applied where "further material recovery through reuse, reprocessing or recycling is not financially sustainable or technically achievable" (p.1). This chapter provides a summary of a detailed assessment of Waste Feedstock Assessment prepared by Arcadis which is included in Appendix I.

The specific terms of the resource recovery criteria are directly inserted into this section to support subsequent discussion.

The EfW Policy Statement's objectives in setting resource recovery criteria are to:

- promote the source separation of waste where technically and economically achievable;
- drive the use of best practice material recovery processes;
- ensure only the residual material from genuine resource recovery operations are eligible for use as a feedstock for an energy recovery facility; and
- energy recovery facilities may only receive feedstock from waste processing facilities or collection systems that meet the criteria outlined in Tables 4 and 5 of the EfW Policy Statement, noting that Table 5 is not relevant to the ARC proposal.

Table 6.4 presents the resource recovery criteria for energy recovery facilities, replicated from Table 4 of the EfW Policy Statement.

Table 6.4 Resource recovery criteria for energy recovery facilities – mixed waste streams (Table 4 of the EfW Policy Statement)

Mixed waste stream	Processing facility	% residual waste allowed for energy recovery
Mixed municipal waste (MSW)	Facility processing mixed MSW where a council has separate collection systems for dry recyclables and food and garden waste.	No limit by weight of the waste stream received at a processing facility.
	Facility processing mixed MSW waste where a council has separate collection systems for dry recyclables and garden waste.	Up to 40% by weight of the waste stream received at a processing facility.
	Facility processing mixed MSW waste where a council has a separate collection system for dry recyclables.	Up to 25% by weight of the waste stream received at a processing facility.
Mixed commercial and industrial waste (C&I)	Facility processing mixed C&I waste.	Up to 50% by weight of the waste stream received at a processing facility.
	Facility processing mixed C&I waste where a business has separate collection systems for all relevant waste streams.	No limit by weight of the waste stream received at a processing facility.
Mixed construction and demolition waste (C&D)	Facility processing mixed C&D waste.	Up to 25% by weight of the waste stream received at a processing facility.

Table 6.4 Resource recovery criteria for energy recovery facilities – mixed waste streams (Table 4 of the EfW Policy Statement)

Mixed waste stream	Processing facility	% residual waste allowed for energy recovery
Residuals from source-separated materials		
Source-separated recyclables from MSW	Facility processing source – separated recyclables from MSW.	Up to 10% by weight of the wastestream received at a processing facility.
Source-separated garden waste	Facility processing garden waste.	Up to 5% by weight of the waste stream received at a processing facility.
Source-separated food waste (or food and garden waste)	Facility processing source – separated food or source- separated food and garden waste.	Up to 10% by weight of the waste stream received at a processing facility.

The ARC will receive waste in the form of residual MSW and C&I waste. Waste supply will be sourced entirely from the Sydney Basin through Veolia's transfer terminals in the Sydney suburbs of Banksmeadow and Clyde. This strategy provides a number of benefits in terms of compliance with the EfW Policy Statement:

- Leverages existing facilities that currently receive significant volumes of residual MSW and C&I waste from the Greater Sydney market, providing comfort around long-term access to feedstock.
- Provides greater certainty of waste supply composition and eligibility through defined pathways for acceptance of EfW feedstock.
- Enhances feedstock control through establishment of specific waste acceptance and quality control procedures, including potential to remove halogenated substances such as PVC piping and other items.

The transfer terminals provide the first control point in an integrated system that features a second opportunity to remove non-conforming wastes at the ARC itself. The transfer terminals provide an opportunity to separate gross recyclables for recovery and to divert materials that are not suitable for energy recovery into the landfill stream. Waste acceptance and sorting procedures at both the transfer terminals and the ARC will target recoverable materials and screen large quantities of non-combustible and undesirable waste.

6.5.2 MSW eligibility

It is estimated that approximately 80% of Veolia's target feedstock (304,000 tonnes per annum) is expected to come from kerbside residual MSW (ie red bin) waste from Greater Sydney Councils. The 'no limit' criteria in Table 4 of the EfW Policy Statement (reproduced as Table 6.1 above) is expected to apply to a significant proportion of the waste stream by the time commissioning of the ARC commences in 2025, and all residual MSW in NSW by 2030.

All metropolitan Councils currently offer a commingled recycling service and, under the recently released *NSW Waste and Sustainable Materials Strategy 2041*[4], are required to transition by 2030 to collection of food organics in a discrete service or as part of a combined food organics and garden organics (FOGO) service. This means all residual kerbside MSW in Greater Sydney will be fully source separated by 2030 and meet the 'no limit' criteria for EfW.

[4] Released in June 2021.

In the unlikely case there is insufficient 'no limit' residual waste to meet the full EfW feedstock requirement, the MSW residual delivered to the Banksmeadow and Clyde transfer terminals from non-FOGO Councils is 40% eligible (by weight), as set out in Table 6.1. This provides flexibility in the short-term if needed to manage the transition period.

It is noted the EfW Policy Statement states that "where a council has a separate collection systems for dry recyclables and food and garden waste", there is "no limit by weight of the waste stream received at a processing facility" for transfer to an energy recovery facility. Without any limit on a feedstock's EfW eligibility, direct transfer from the point of generation to the ERF must be permissible, without requiring additional pre-processing. Veolia, however, has the opportunity to provide feedstock quality control at the transfer terminals and then again at the ARC.

6.5.3 C&I eligibility

The balance of target feedstock for the Woodlawn ARC is putrescible residual C&I waste (up to 20% being approximately 76,000 tpa) aggregated at the Banksmeadow and Clyde transfer terminals.

No more than 50% of C&I waste received at the transfer terminals will be sent to the Woodlawn ARC, meeting the minimum eligibility scenario in the EfW Policy Statement for mixed C&I waste from any source as set out in Table 6.1 above. The low recycling potential for putrescible C&I waste means this represents a significant diversion from landfill to a defined recovery outcome, including initial sorting and energy recovery.

The 50% limit is a conservative position. Given approximately 20% of C&I waste received will be directed to EfW, Veolia will be highly selective of loads for delivery to the ARC. This facilitates selection according to operational suitability but also preferential targeting of loads from commercial customers eligible for the 'no limit' C&I waste category.

As a tier one collector, Veolia has a relatively high proportion of large scale commercial customers in its portfolio, which are more likely to have separate collections for all "relevant waste streams", at minimum expected to include paper/cardboard, organic collection and residual waste collection (as per the "notes" under Table 5 of the EfW Policy Statement).

Source separation of C&I streams is expected to increase over time in response to organisational commitments to sustainability and climate change, the rising cost of putrescible landfill and government policies addressing the circular economy, product stewardship and the mandate for food organics collection for key sectors in the *NSW Waste and Sustainable Materials Strategy 2041.*

6.5.4 Waste composition

Veolia has a significant share of the residual MSW and C&I waste collections market in Greater Sydney, with a collections portfolio that includes both long-term council contracts and shorter-term contracts with commercial and industrial customers. This share of the market provides confidence in the ability to retain or replace contracts over the long term in order to maintain the quantity and quality of feedstocks.

Veolia has commissioned recent compositional audits of both waste streams. For municipal waste, audits were undertaken of waste from several Sydney councils, one of which has a partial FOGO system (optional trial). All samples contained a large fraction of organics (Figure 6.2 and Figure 6.3 and Table 6.5), which is consistent with the national average of 35% food content, followed by paper and plastic (excluding PVC).

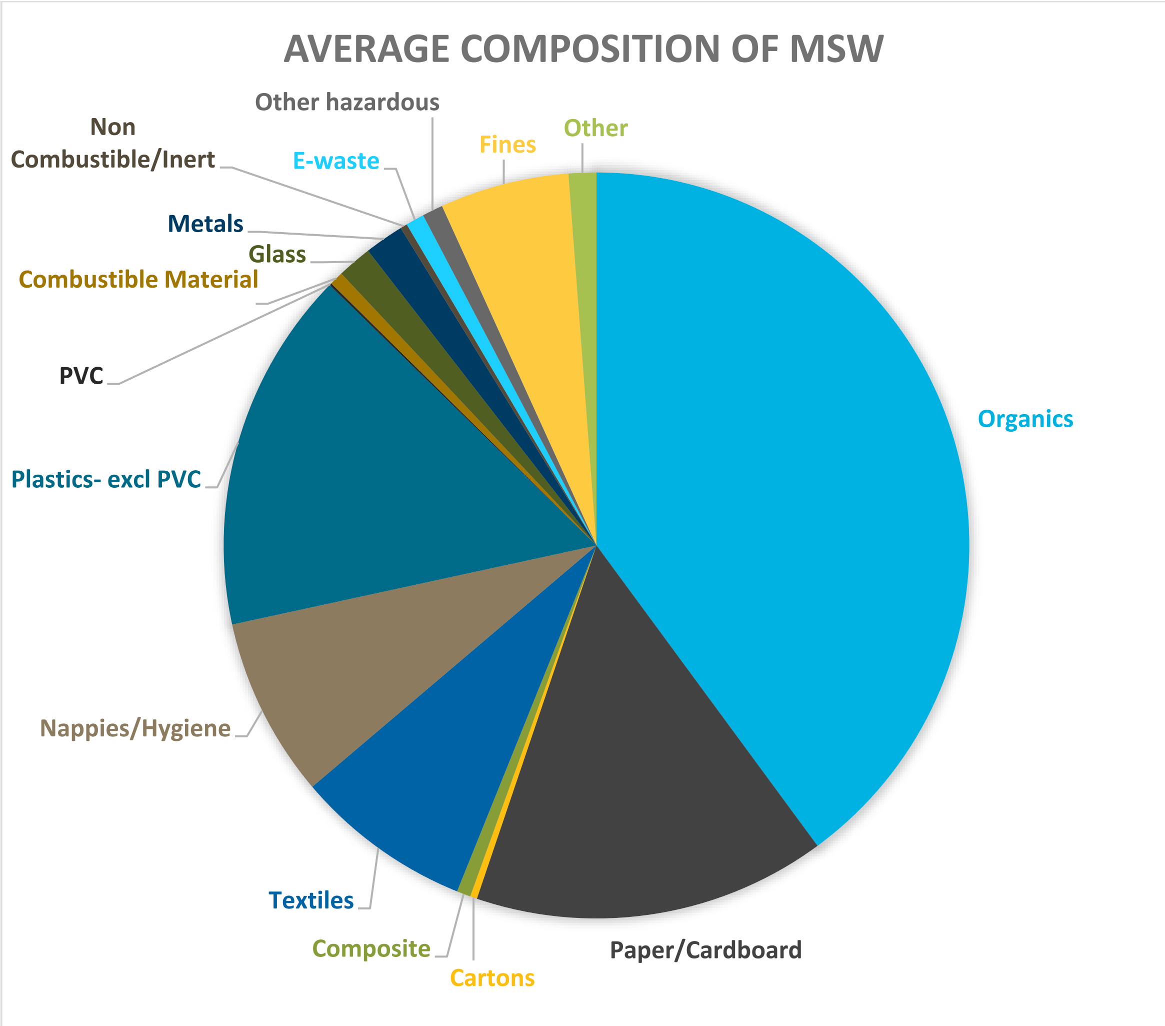


Figure 6.2 Composition of MSW (based on the mean average of 5 samples, Nov. 2021)

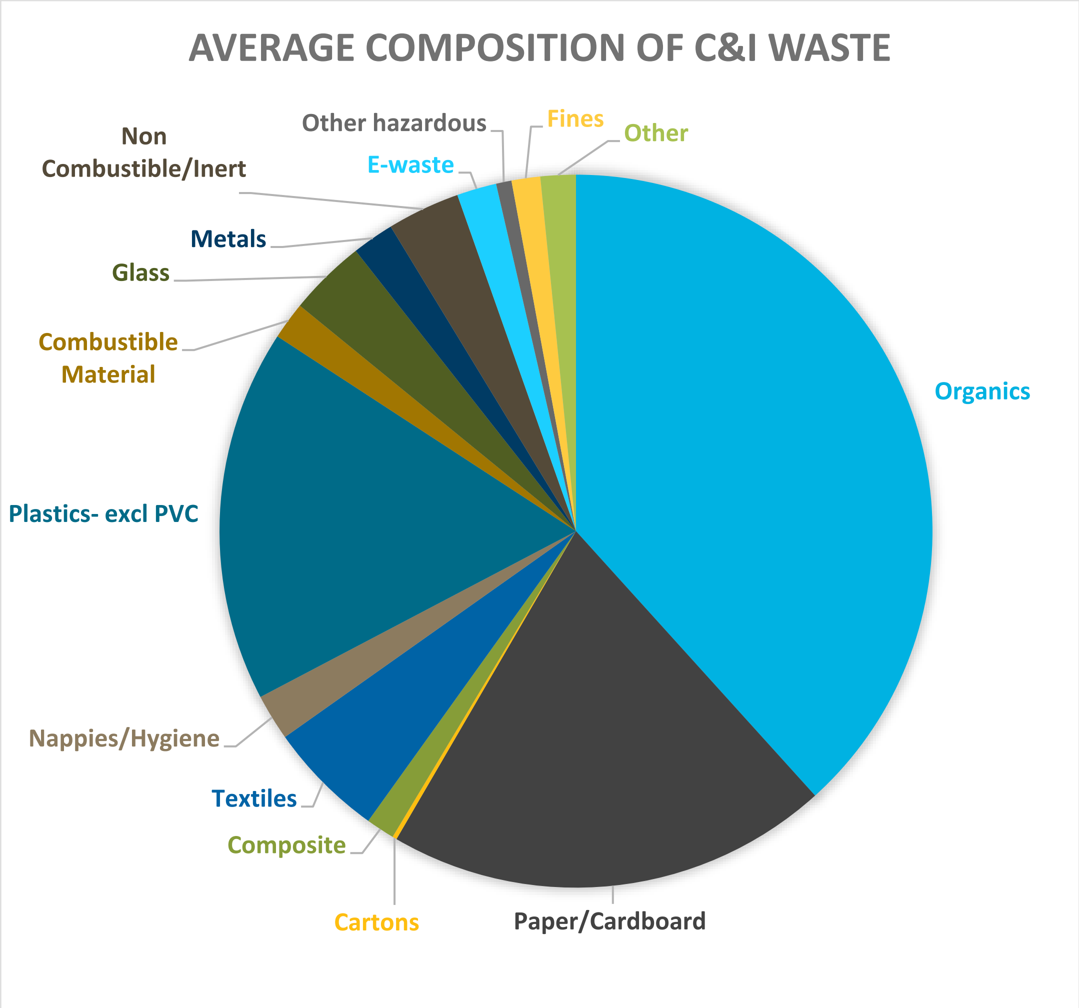


Figure 6.3 **Composition of C&I waste received at the Banksmeadow and Clyde Transfer Terminals (based on the mean average of 20 samples, June 2021)**

These compositional audits show the key impact of the increasing policy and industry focus on food organics and plastics, which will optimise the source separation potential of both MSW and C&I waste. It is expected that the proportion of these two materials will reduce over time through mandatory collection of food organics and the goal to triple the NSW plastics recycling rate. These changes are well understood and have been integrated as sensitivities in the waste flow modelling and considered by Veolia in their assessment of residual calorific value.

This data illustrates the volume of PVC present in MSW and C&I waste, which is a key focus for waste acceptance and quality control processes given the EfW Policy Statement focus on halogenated substances.

Table 6.5 Percentage (mean average) of MSW and C&I waste received at the Banksmeadow and Clyde Transfer Terminals

Category	MSW	C&I
Organics	39.9%	38.3%
Paper/cardboard	15.3%	20.1%
Cartons	0.3%	0.2%
Composite	0.6%	1.3%
Textiles	7.7%	5.3%
Nappies/hygiene	7.8%	2.1%
Plastics – excl PVC	15.7%	16.9%
PVC	0.1%	0.0%
Combustible material	0.6%	1.7%
Glass	1.5%	3.5%
Metals	1.7%	1.9%
Non-combustible/inert	0.3%	3.3%
E-waste	0.8%	1.8%
Other hazardous	0.9	0.7%
Fines	5.6%	1.3%
Other (specify)	1.2%	1.6%
Total	**100.00%**	**100.00%**

From this modelling Veolia have developed an anticipated waste composition profile (or design waste) for the life of the project which reflects likely changes in waste policy and composition over coming decades, noting that the technology can handle a wider range for waste inputs. This is provided in Table 6.6.

Table 6.6 Anticipated waste composition range

Waste composition	Composition range %
Organics	22.4–36.7
Paper/Cardboard	15.9–20.5
Cartons	0.3–0.4
Composite	0.7–1.0
Textiles	7.7–10.1
Nappies/Hygiene	7.2–10.4
Plastics – excel PVC	16.4–20.2

Table 6.6 Anticipated waste composition range

Waste composition	Composition range %
PVC	0.1–0.1
Combustible Material	0.7–1.1
Glass	1.6–2.4
Metals	1.8–2.2
No combustible/inert	0.3–1.2
E-waste	0.0–1.3
Other Hazardous	0.0–1.2
Fines	5.1–7.4
Other	1.2–1.6

6.5.5 Feedstock supply projections

As noted previously, Veolia commissioned a detailed review of waste feedstock availability for the project, provided in Appendix I. It includes detailed modelling of waste generation under the NSW Government's recently revised policy settings. Key conclusions are summarised here.

i MSW

Despite some reductions in the rate of MSW residual generation per capita, the trajectory for this waste stream would be net positive without the interventions recently announced under the WASMS. Table 6.7 shows the new MSW residual waste generation base case, with a significant reduction in comparison to forecasts without the mandatory policy interventions. This analysis highlights how higher order resource recovery opportunities are being maximised through the WASMS, supporting the goals and tiered eligibility framework of the EfW Policy Statement.

Table 6.7 Feedstock forecasts 2020–2050

Scenario	2020	2030	2040	2050
Total MSW Residual Waste (MLA, without 20YWS interventions)	1,799,052	1,941,677	2,179,348	2,179,348
Total MSW Residual Waste (MLA, inclusive of 20YWS interventions)	1,799,052	1,691,709	1,687,468	1,687,468
Total MSW Residual Waste (Sydney Basin, without 20YWS interventions)	1,447,060	1,585,072	1,800,427	1,800,427
Total MSW Residual Waste (Sydney Basin, inclusive of 20YWS interventions)	1,447,060	1,343,445	1,374,488	1,374,488

Figure 6.4 shows total MSW residual waste generated in the Sydney Basin (black), inclusive of kerbside collections, clean-up, drop-off waste and other MSW streams included with the NSW EPA's WARRP estimates. Only putrescible kerbside residual waste (grey line) is a target feedstock, with data informed by the LG WARR Survey data. The red line represents the sum of all kerbside residual waste currently contracted to the Eco Precinct, with Veolia assumed to maintain their current share of the Greater Sydney putrescible waste market given factors of scale, reputation and access to increasingly critical transfer capacity.

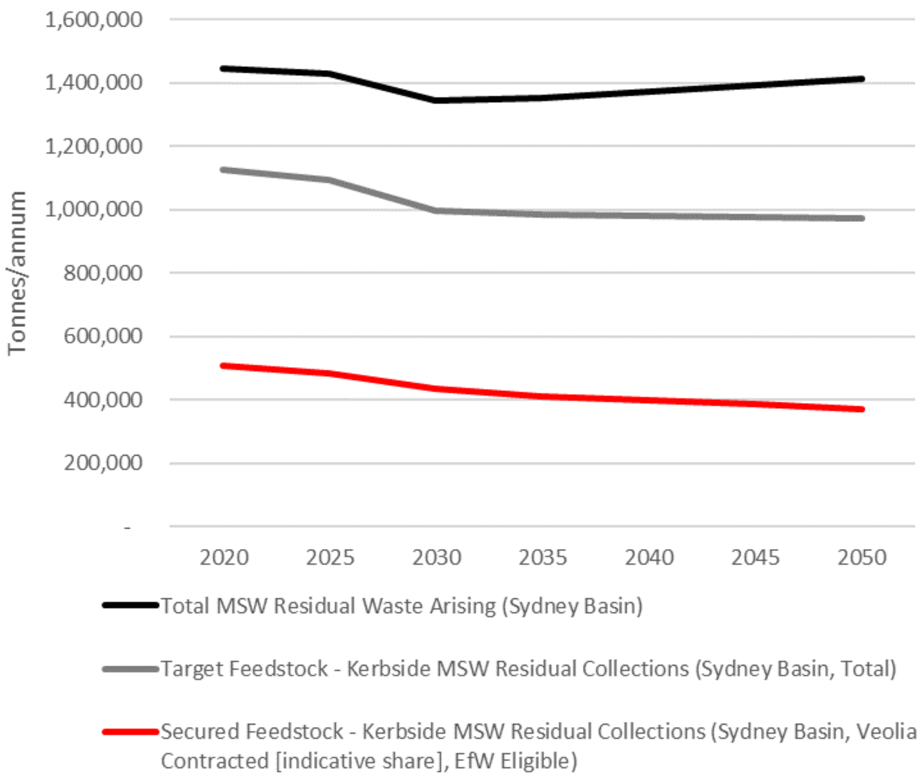


Figure 6.4 Sydney Basin total MSW residual waste and the kerbside collected putrescible stream, with Veolia's share of market (assumed constant)

The forecast shows that even under this optimistic base case, where Councils improve their recycling by diverting an extra 1% per annum per year from the residual waste stream into the FOGO/FO and commingled recycling stream, there remains a need for residual waste solutions. It indicates that if Veolia maintains their market share for kerbside residual services, then the quantity of EfW eligible residual MSW received at the Eco Precinct will by itself exceed the total feedstock needs of the ARC (including C&I waste).

ii C&I waste

Figure 6.5 shows the results of Arcadis modelling with regard to putrescible residual C&I waste in the Sydney market.

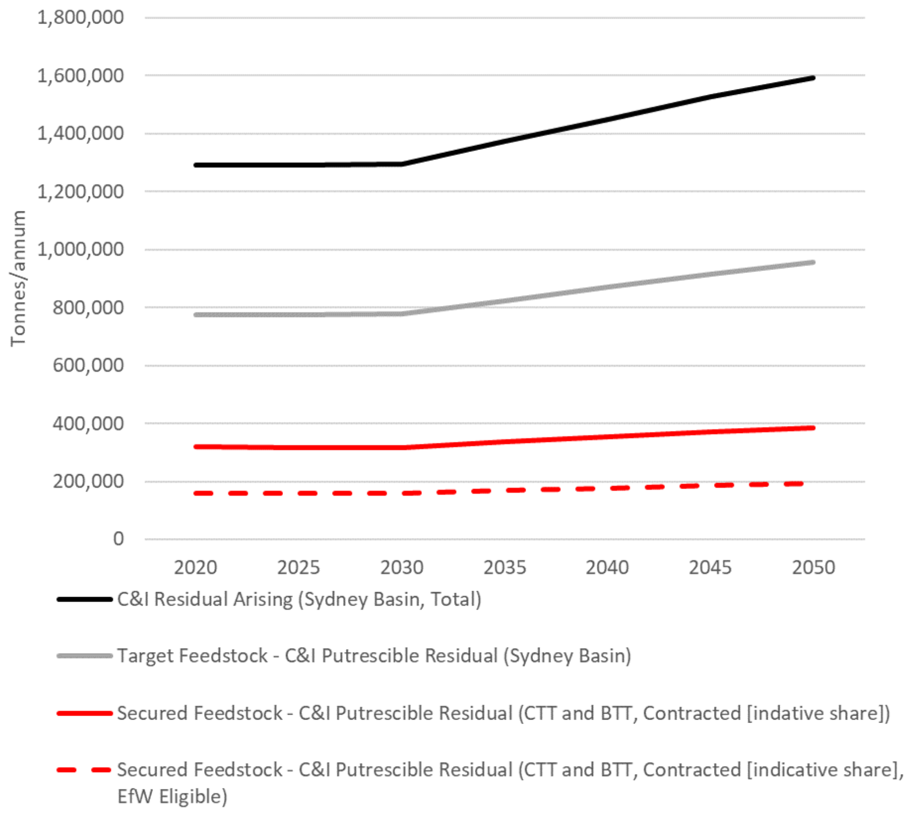


Figure 6.5 Sydney Basin total C&I residual waste and Veolia's share of market (assumed constant), with indicative 50% EfW eligibility

iii Summary

Veolia's target feedstock is residual waste received at Banksmeadow and Clyde Transfer terminals after source separation and onsite recovery opportunities have been maximised.

In summary, the baseline feedstock analysis of the Sydney Basin estimates total generation of approximately 1.8 million tonnes across the target waste streams in 2030, with net positive growth over the forecast period. The analysis also shows 590,000 tonnes in secure EfW eligible waste (assuming a conservative 50% C&I waste eligibility) in 2030, which is 210,000 tonnes surplus to the requirements of the ARC with a capacity of 380,000 tonnes per annum. Full details of the analysis can be found in Appendix I.

Table 6.8 Underlying data for combined MSW and C&I waste in the Sydney Basin and Veolia's tonnes under contract based on indicative market share (tonnes)

Scenario	2020	2030	2040	2050
Total MSW and C&I Arising Waste (Sydney Basin)	2,738,715	2,638,587	2,823,824	3,008,098
Combined Target Waste (Kerbside Residual MSW and Putrescible Residual C&I)	1,900,581	1,774,156	1,852,812	1,927,816
Combined Target Waste (Veolia Contracted [indicative share])	829,124	751,650	753,215	757,855
Combined Residual (Veolia Contracted [indicative share, EfW eligible)	669,324	592,942	576,952	565,331

iv Competing projects

The Arcadis analysis also investigated the impacts of competing ERF projects on the feedstock supply for the ARC, with the results summarised in Figure 6.6 below. At the time of the Arcadis report five competing facilities were identified. Arcadis indicated that even in the unlikely scenario that all were developed and went into operation, there was a sufficient supply to meet all needs. However since the publication of the EfW Infrastructure Plan in 2021, two projects have withdrawn their applications (Jerrara Power Energy from Waste Facility SSD-22879238 and Mt piper Energy Recovery Facility SSD-8294) and there is uncertainty around a number of other facilities as they are not located within a nominated precinct within the EfW Infrastructure Plan.

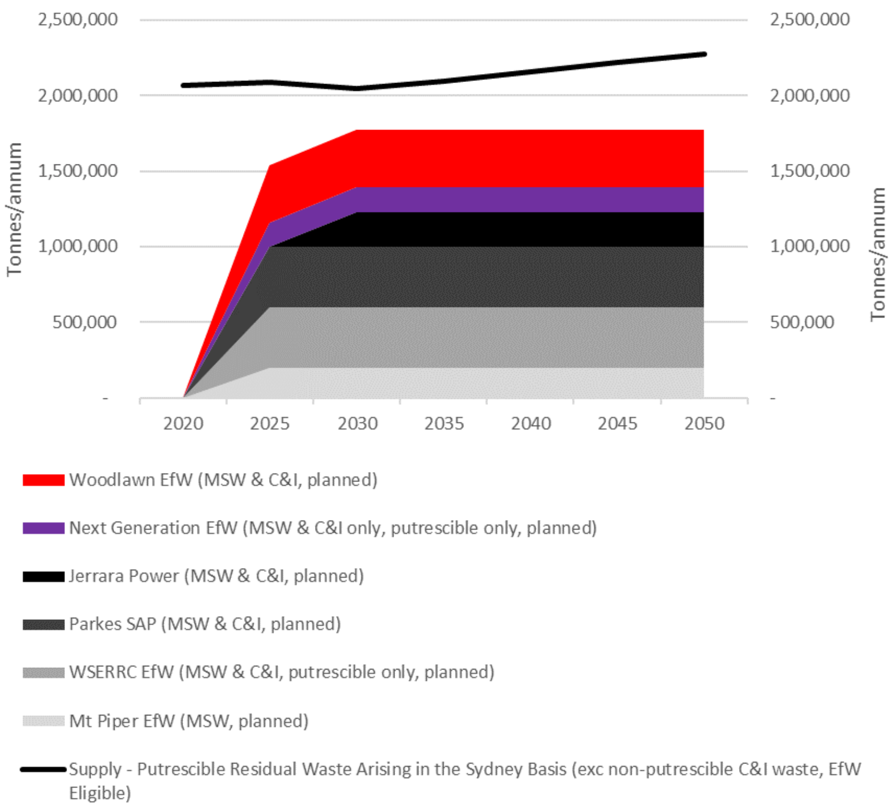


Figure 6.6 Putrescible waste supply and cumulative capacity of proposed EfW facilities (assuming all facilities are developed)

6.5.6 Summary and conclusion

In conclusion, it can be seen that Veolia currently has access to sufficient supplies of residual putrescible MSW feedstock, which is compliant with Table 4 of the EfW Policy Statement, and therefore an eligible EfW feedstock. In future, as more Council's transition to FOGO as required by the WASMS, the availability of eligible feedstock will increase.

Similarly, Veolia has access to ample eligible C&I waste to meet the needs of the ARC. The analysis by Arcadis indicates that a sufficient supply of feedstock is available for competing projects, and it is noted that the recently released EfW Infrastructure Plan has further limited the competition in NSW.

Therefore, modelling based on current policy settings indicate there is a sufficient supply of eligible feedstock to meet the needs of the ARC project throughout its lifespan.

Chapter 7

Engagement

7 Engagement

7.1 Introduction

This chapter summarises the findings of the community and stakeholder engagement that has been carried out for the project during scoping and preparation of the EIS. It also identifies further engagement during the EIS public exhibition, the assessment period and, contingent on project approval, during construction and operation.

This chapter discusses community engagement, where 'community' is defined in accordance with *Undertaking Engagement Guidelines for State Significant Projects* (DPIE 2021c):

> …the people and groups that are interested in, or affected by a State significant project, such as local residents, community groups, Aboriginal and Torres Strait Islander communities, culturally and linguistically diverse communities, peak bodies, and businesses.

Engagement has been completed with reference to the aforementioned *Undertaking Engagement Guidelines for State Significant Projects* (DPIE 2021c), as well as the relevant SEARs outlined in Appendix A.

Further details of community and stakeholder consultation, issues raised to date and supporting documents are provided in Appendix K.

7.2 Community engagement history at the Eco Precinct

Veolia has operated the Eco Precinct since 2004 and has actively engaged with relevant stakeholders, placing significant emphasis on building deep and constructive relationships with its direct neighbours and the local community.

Community engagement activities at the Eco Precinct first began following the former mining operation going into administration in 1998. Veolia took over the responsibility of the former mine site to repurpose the degraded area for waste management, and to eventually rehabilitate previously disturbed areas. The first community committee, the Tarago Residents Committee, was established. Veolia paid the miners their outstanding entitlements that were owed following the mine going into administration, demonstrating Veolia's commitment to the local community and economy.

Following approval being granted for the development of the Bioreactor landfill, Veolia established the Community Liaison Committee (CLC) in 2001, which continues to function. The purpose of the CLC is to achieve an open and transparent dialogue between operations at the Eco Precinct and the community. The regular meetings provide an opportunity for Veolia to share quarterly updates on its operational activities, and a forum for committee members to provide feedback as individuals and from the wider community. Actions from these sessions are recorded and made publicly available on Veolia's Woodlawn Eco Precinct website (https://www.veolia.com/anz/WoodlawnEcoPrecinct).

Further to the establishment of the CLC, Veolia set up the Veolia Mulwaree Trust to enable financial support to worthwhile local community projects across seven surrounding local government areas. At the time of this report, Veolia has contributed over $12 million to the local community through the Veolia Mulwaree Trust. This has been spread over 1,500 community projects, ranging from parks and sporting centres to arts initiatives and scholarships. A full list of the support given through the Veolia Mulwaree Trust can be found on the Veolia Mulwaree Trust website (https://www.veolia.com/anz/about/about-veolia/corporate-social-responsibility/veolia-mulwaree-trust).

Veolia also supports the local area with its host fees, community projects and road contributions. Since 2004, over $30 million has been provided to the Goulburn Mulwaree Council in the form of host fees, specific community projects including via the Veolia Trust, and for road upgrades and maintenance. Additional funding has also been allocated to the Queanbeyan Palerang Regional Council for road upgrades.

Veolia is also committed to educating people on the importance of sustainable waste behaviours. A key part of this is raising awareness of its existing operations. Every year the Eco Precinct welcomes more than 2,500 visitors from nearby school and university groups, local community groups, academics and industry peers.

Developing and maintaining positive relationships with local stakeholders is a foundational priority for Veolia's existing operations. This priority has been highlighted in the approach to community and stakeholder engagement as a key element of Veolia's proposed ARC project.

7.3 Consultation approach

To ensure Veolia delivered meaningful engagement that considered the needs of all stakeholders, Veolia engaged specialist communication and engagement consultants from ERM to support stakeholder engagement.

In preparing to engage with community and stakeholders, Veolia considered and incorporated the NSW Department of Planning, Industry and Environment's *Undertaking Engagement Guidelines for State Significant Projects* (DPIE 2021c). The guidelines provide a roadmap for proponents on:

- planning the approach to engagement;
- undertaking engagement to inform the development of the proposal and contribute to better planning outcomes; and
- reporting back and demonstrating how engagement has shaped the proposal.

The guidelines also outline the engagement expectations, which have been implemented by Veolia, and include:

- plan early in the scoping phases to identify the stakeholders who may have an interest in or are affected by the project;
- engage as early as possible to allow potential issues to be identified, avoided, or managed;
- ensure effective engagement by providing the information community, councils, and government agencies need to understand a project and its impacts and are given the opportunity to participate in a meaningful way;
- ensure engagement is proportionate to the scale and impact of the project;
- be innovative in maximising use of current and emerging platforms; and
- be open and transparent by reporting back on processes, key decisions, and outcomes of what was heard, what changed, and why.

The pre-EIS consultation process was also developed in alignment with leading practice in engagement, including consideration of the International Association for Public Participation (IAP2) Quality Assurance Standard.

Engagement commenced in the project concept and scoping phase and continued throughout the EIS preparation. Engagement was dynamic and was adapted in response to community feedback during the scoping phase as well as during preparation of the technical studies as part of the EIS.

Veolia understands that effective communication and engagement activities with the community are vital to the successful delivery of the project. Veolia remains committed to engaging the community and stakeholders throughout the planning process and will continue to do so as the project progresses through the assessment process.

Section 7.5 provides further detail on future engagement to support the public exhibition of the EIS, and ongoing activities should development consent be granted for the project.

7.4 Engagement carried out

7.4.1 Identifying project and community stakeholders

Veolia has long-standing relationships with a number of stakeholder and community groups in the area surrounding the Eco Precinct. When considering who to engage with for the ARC project, three classifications of stakeholder were used:

- people or organisations with a role in delivering the project;
- people or organisations who either will, or may, be directly affected by the project; and
- people or organisations who may be interested in the project.

This helped shape the project stakeholder map, which is summarised in Table 7.1 below. Veolia also received direction from the SEARs on which organisations required engagement. A full stakeholder map for the project can be found in Appendix K.

Table 7.1 ARC project stakeholder identification

Stakeholder classification	Stakeholders	
People or organisations with a role in delivery	• Federal Minister for Energy and Emissions Reduction. • Australian Renewable Energy Agency. • NSW DPE: – Planning and Assessment; – Environment, Energy and Science; – Biodiversity and Conservation; – Water; and – Natural Resources Access Regulator. • NSW Environment Protection Authority (EPA). • NSW Independent Planning Commission.	• NSW Health (Murrumbidgee Local Health District). • Department of Regional NSW. • NSW Independent Planning Commission. • NSW Minister for Planning and Public Spaces. • NSW Minister for Energy. • NSW Minister for Environment. • Goulburn Mulwaree Council. • Queanbeyan-Palerang Regional Council.

Table 7.1 ARC project stakeholder identification

Stakeholder classification	Stakeholders	
People or organisations who will or may be directly affected by the project.	• Goulburn Mulwaree Council. • Queanbeyan-Palerang Regional Council. • Canberra Region Joint Organisation (CRJO). • Residential neighbours. • Nearby land owners. • Traditional land owners. • Eco Precinct employees. • Commercial neighbours. • Emergency Services. • Utility providers. • Air Services Australia. • Civil Aviation Safety Authority. • Other state government departments. • Federal and state government stakeholders. • Traditional landowners. • Upper Lachlan Council. • Yass Valley Council.	• Local community groups including: – Veolia CLC; – Tarago and District Progress Association Inc. (TADPAI); – Veolia Mulwaree Trust; – Tarago Landcare; – Country Women's Association Goulburn; – Country Women's Association Tarago; – Country Women's Association Braidwood; – Tarago and District Men's Shed; and – Tarago Sporting Association. • Residential neighbours and landholders. • Woodlawn employees. • Commercial neighbours. • Education providers: – Tarago Public School; – Tarago Pre-school; – HVTC Southern Tablelands; and – TAFE NSW.
Other interested stakeholder groups	• Other government agencies. • Other local councils. • Industry/peak bodies. • Environmental groups.	• Business groups. • Education and skills providers. • Media.

7.4.2 Community and stakeholder engagement activities

The engagement process has been designed to be inclusive, transparent, structured and meaningful for the local community and broader stakeholders. It has included a variety of communication tools and activities to promote awareness of the ARC project, provide information and encourage feedback. Examples of project communication materials can be found in Appendix K.

As part of the consultation prior to the lodgement of the EIS Veolia has hosted a series of onsite open days, online sessions (particularly during COVID-related lockdown periods), a meet the experts session in Tarago, pop-up stalls in town and at local community events, regular CLC meetings, meetings with local community groups, updates in local print media and Veolia's project-specific website, local letterbox drops and face to face meetings with immediate neighbours.

The overarching approach for the engagement activities undertaken was to provide a transparent, structured and meaningful engagement program for the local community and stakeholders. The program has included:

- announcing the project early and explaining the planning process;
- raising awareness of the project and planning application through detailed briefings with stakeholder and community groups;
- creating simple and clear project information materials to help inform the wider community and increase understanding about the project;

- establishing project communications channels to allow people to find out more information and share feedback, including a website, 1800 number and subscription newsletter;
- hosting site tours and open days at the Eco Precinct to allow people to visit the site and speak to Veolia team members directly about the project;
- responding to feedback by holding a number of community information sessions specifically on how EfW technology works and how air quality will be managed;
- sharing regular project updates through community and stakeholder mailouts, including feedback forms and online surveys;
- project team members personally door knocking neighbours to discuss the proposal;
- arranging a community connection session with the Woodlawn Eco Precinct CLC and the Staffordshire ERF reference plant CLC;
- providing multiple and varied opportunities for community members to provide feedback on the proposal; and
- providing opportunities at community information sessions for local residents and representatives to engage directly with the independent experts conducting the air quality and human health impact studies.

A detailed breakdown of engagement activity by stakeholder group can be found in Appendix K.

7.4.3 Aboriginal stakeholder engagement

As outlined in Section 8.11, Aboriginal consultation for the ACHA has conformed with Heritage NSW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), and included provision of information to Registered Aboriginal Parties (RAPs), and notification of the various field survey and excavation activities associated with the project. The consultation process initially identified 48 Aboriginal stakeholder organisations with potential interest in the project area. Following a notification process, 14 responded to be registered for subsequent consultation through the project.

Between July and October 2021 online meetings were held with nine RAPs to provide a virtual tour of the development footprint and discuss the intangible values of the site. A field survey was subsequently undertaken on 21 November 2021, and four RAPs were available to participate. Feedback from the RAPs has been positive, with strong interest to continue working with Veolia throughout the project development for all matters relating to Aboriginal cultural heritage and local socio-economic opportunities.

7.5 Community views and outcomes

This section summarises the key findings of the community and stakeholder engagement carried out during the preparation of the EIS, refer to Appendix K for a detailed description.

Stakeholder and community views regarding the project have been understood through:

- ongoing consultation and engagement activities as described above in Section 7.4;
- in-depth interviews with local residents and key stakeholders as part of the preparation of the project's Social Impact Assessment (Appendix CC); and
- feedback received from organisations via responses to SEARs.

Feedback from stakeholders and the community has been varied, and includes both positive, neutral and negative views on a range of matters. Interest in the project came from residents in the broader local areas surrounding the Eco Precinct, as well as from the community of Tarago.

The local community holds a range of views, with most people recognising the economic value of the project and the benefits that will flow to the region through jobs and growth, as well as the project's place in the waste management hierarchy. Community stakeholders are concerned about how the environmental impacts will be managed – in particular air quality, human health (including agriculture) and odour. This is particularly true of people living close to the Eco Precinct in the community of Tarago and surrounds.

The community and stakeholders have expressed interest in understanding how the technology works. Other concerns raised were around traffic, transport and water pollution and usage.

A summary of the key themes from feedback received during engagement is shown in Figure 7.1.

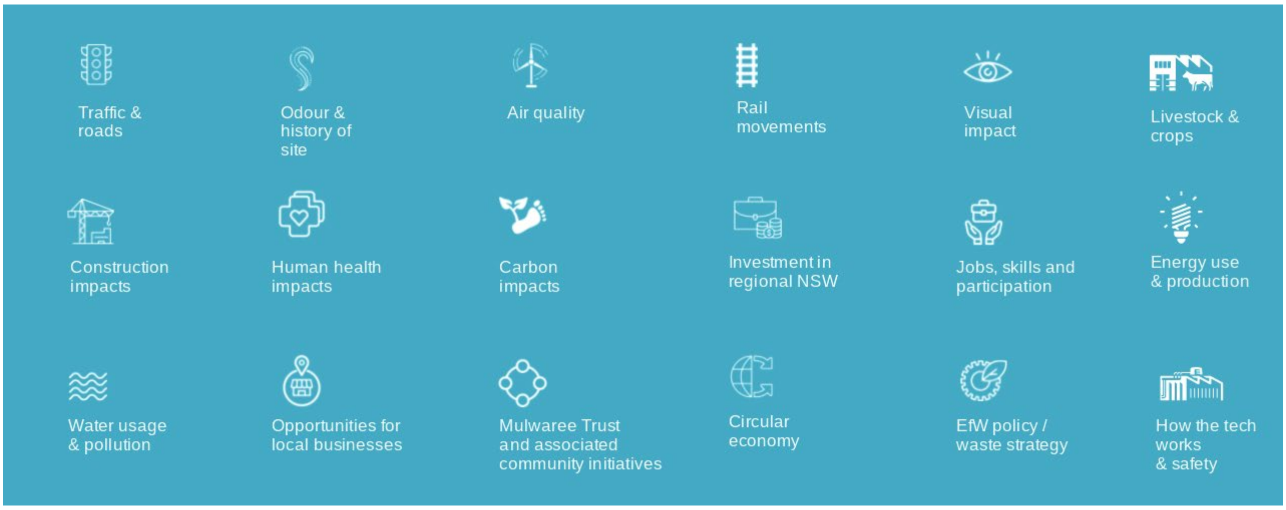


Figure 7.1 Summary of key feedback themes during engagement for the project

7.5.1 Feedback from community open days

As part of the ARC early engagement process, Veolia gave local people and stakeholders an opportunity to visit the Woodlawn Eco Precinct to learn more about the project, meet the team and participate in a site tour.

The first community open day at the Eco Precinct was held on 18 April 2021 and in response to community feedback, a second Open Day was held on 20 June 2021.

In total, 45 people attended across the two days. The open days included a project information area, with information boards, videos and project representatives available to answer questions. There was also the opportunity for a site tour, which generated a high level of interest and approval amongst those who attended. A core objective was to invite feedback on the proposal, with survey forms provided to encourage people to share their views.

Feedback received during the community open days included:

- air quality, emissions and air quality monitoring processes and management;
- how odour from the existing landfill operation will be addressed;
- road traffic and rail transport associated with the project;
- management of hazardous waste;

- water management and use; and
- positive aspects associated with environmentally responsible waste management.

Following the open days, Veolia updated its project website to include all of the information provided to residents during the course of the sessions and also updated the project communications materials to include more information on the topics of concern.

7.5.2 Feedback from neighbours

Throughout the months of April to August 2021, Veolia team members door-knocked all immediate neighbours to the Eco Precinct. The purpose of this activity was to ensure those most closely located to the ARC site were fully aware of the proposal and to provide an opportunity for neighbours to ask questions. As part of these meetings, residents were provided a briefing about the project and were given a copy of the project information brochure. Some owners of neighbouring properties do not reside at the property and may be only occasionally present. Project information including contact details and invitations to the Community Open Days was left at neighbouring properties where the owner was not present at the time of the door-knocking.

The following topics were raised during conversations with neighbours about the ARC:

- air quality, emissions and air quality monitoring processes and management;
- potential for impact to local farming, crops and livestock;
- traffic and rail impacts – whether the new proposal would require more trains and more trucks;
- local employment opportunities – what type of jobs and how many would be created;
- water usage – how much water is needed and whether Veolia will be collecting rainwater;
- visual impact – how the existing cultural, vegetation and terrain considerations will be reflected in the design of the facility and the landscaping;
- odour from the existing operation; and
- requests for further project updates and opportunities to meet with the project team.

Some residents indicated that they had not attended the Community Open Days because they did not feel they were directly impacted by Veolia's existing or future activities. Other residents were pleased that Veolia had taken the time to make direct contact and indicated they appreciated receiving the personalised update, regardless of their position on the project.

Further door-knocking was completed between the months of March to May 2022, targeting residents living in broader and nearby communities. As part of these meetings, residents were provided an opportunity to learn more about the project, hear about the project status and were given a copy of the project information brochure.

In addition to the topics already identified the following topics were raised during discussions with the community:

- questions about the project approval process;
- concerns about local roads and whether they will be updated as part of the project; and
- questions about reference sites and reports that demonstrate the effectiveness of energy from waste in other locations, with a particular focus on rural locations.

7.5.3 Feedback from community information sessions

Online information sessions

During early engagement in the scoping phase, the local community and stakeholders indicated they would like to understand more about how EfW technology works, and how the air quality impacts in particular would be managed.

In response to this, Veolia arranged for three online community information sessions to provide opportunities for the community and stakeholders to engage with EfW experts from the project team and discuss the ARC project in detail. These were held in an online format to comply with NSW Health guidelines and COVID restrictions. The sessions took place on 9, 11 and 15 September 2021. In total, 33 households attended across the three dates and more than 70 questions or comments were received on topics including:

- air quality;
- health impacts;
- transport impacts;
- location of the site;
- odour from the existing operation;
- air quality monitoring;
- plant operation including safety; and
- the duration of the EIS public exhibition period.

A recording of the webinar was published on the project website and an update was made to the project Frequently Asked Questions document, so that people who were not able to attend the sessions could have the opportunity to view the same information.

Community pop up events

During the months of May and June 2022, Veolia held two pop-up information sessions outside grocery stores in Bungendore and Braidwood to engage community members living in nearby towns. During these pop-ups, representatives of Veolia engaged with more than 30 members of the local community.

Feedback was provided to a range of questions regarding:

- the EIS assessment process, with a particular focus on air quality and human health;
- whether or not energy from waste technology is being phased out in Europe; and
- the waste hierarchy and the State's overall sustainability targets.

Connecting with our reference facility

On 4 May 2022 Veolia arranged an online meeting between members of its CLC and CLC members from Veolia's reference plant, the Staffordshire ERF. The session was designed so that Australian community representatives could ask questions on what it's like to live near an EfW facility, in a peer-to-peer format. Veolia experts working at the facility were also on the call and the session was run by an independent facilitator.

There were seven Australian CLC and/or council representatives on the call, two Veolia Australia representatives, two Staffordshire CLC members and three Veolia Staffordshire representatives.

Feedback was provided to a range of questions regarding:

- community experience pre, during and post construction of Staffordshire Energy from Waste facility;
- Staffordshire operational performance and community engagement; and
- human health impacts, with a particular focus on impacts to drinking water.

Meet the Experts information session

On 4 June 2022 an information session was held at the Tarago Town Hall to directly engage the community with the independent experts conducting the Air Quality Impact Assessment (AQIA) and Human Health Risk Assessment (HHRA).

The event was advertised via letterbox drop, newsletter, advertising in the Tarago Times and Goulburn Post newspapers and was promoted on the project website.

Forty-four local community members and stakeholders attended the session. As part of this session, Veolia offered two tours of its facility for those interested in learning more about existing operations at the Eco Precinct. Nine people participated in the tours.

Feedback was provided to a range of questions regarding:

- air quality and human health, with a particular focus on farming;
- Energy from Waste filtrations of gases and management of ash by products; and
- odour from existing operations and the potential for odour from the proposed facility.

7.5.4 Summary of key themes raised

A summary of key themes raised during engagement and where these are addressed in the EIS is provided in Table 7.2. A more detailed response to matters raised is provide in the Community Engagement Outcomes Report in Appendix K.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
Air quality and human health-related impacts	Health impacts to people from air emissions. Impacts on agriculture from air emissions. Dispersion of air emissions and how prevailing winds will impact this. The risk of burning hazardous materials, tyres and plastics. Use of diesel fuel to achieve necessary combustion temperatures. Air pollution controls proposed for the project.	Air quality and human health impacts are key themes raised by stakeholders consistently during engagement. Based on feedback from early community engagement, Veolia increased the amount of information made available to the community on EfW technology and in particular, how air quality would be managed. Veolia undertook three dedicated online Community Information Sessions to explain the technology, demonstrate how air quality will be monitored and managed, and the role of the NSW Environment Protection Authority in providing independent oversight and regulation on environmental impacts from the ARC. Veolia also held a Meet the Experts community information session, where independent experts explained how assessments are undertaken to measure against the safe operating limits set by the Government. In addition to these events, Veolia has provided the community with: • Additional air quality management information on Veolia's website. • Access to the information used during community events for those who were unable to attend. • Information on reference sites in the UK and Europe, so that residents can see how other EfW sites operate. As part of this, Veolia also held an online community information session to connect the Woodlawn CLC with CLC members from its reference site in Staffordshire. • A list of academic studies independent of Veolia on its website, which demonstrates the safety of EfW technology. If the project is approved, air quality emissions data, including the energy generated, will be made available as part of a continuous emissions monitoring system (CEMS). The validated emission monitoring data will be made available publicly as described in the AQIA (Appendix O). In response to the community's concerns, Veolia will implement an ambient air quality monitoring program to measure air quality surrounding the Eco Precinct. Veolia has asked the community to have their say on where the monitors will be installed as part of the Meet the Experts event. Veolia will work with the community to determine the best way to present the data/information from the monitors. The HHRA (Appendix P) indicates the contribution of pollutants in soil the surrounding area (accumulated for deposition over 70 years) would not be measurable. The NSW Chief Scientist report on EfW (NSW Government 2020) indicates that air monitoring is the most robust approach to assessing off-site impacts, including multi-pathway exposures. An ambient air quality monitoring program will be developed for the project and emission from the project will be monitored using a CEMS which will monitor emissions from the EfW plant stack to ensure that relevant emissions criteria are not exceeded. Air quality impacts and a description of pollution controls and monitoring are assessed/described in Appendix O and summarised in Section 8.1. Human health impacts (including impacts related to agricultural production) are assessed in Appendix P and summarised in Section 8.2. The characterisation and management of waste feedstock is assessed and described in Appendix I and Appendix G. Diesel fuel use is discussed in the AQIA in Appendix O.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
Odour impacts	Odour from existing Bioreactor landfill. Odour from the proposed ARC.	Veolia recognises that odour from existing operations is and has been an issue for some people living nearby, and is committed to reducing odour impacts. Odour management is a high priority for both Veolia and the community. Veolia has a Woodlawn Eco Precinct Odour Management Strategy that is regularly updated through community consultation, independent expert input and results from the landfill gas monitoring program. The strategy includes routine odour audits and recommendations for odour management upgrades. Examples include the installation of additional landfill gas capture infrastructure, odour treatment technology trials and innovative odour monitoring equipment. Regular updates are provided to the community through a range of media including the ARC website, newsletter, CLC and published updates in the Tarago Times. Current and upcoming odour reduction works involve: • Drone surveillance at six monthly intervals to measure landfill gas capture across the landfill waste surface. The surveillance identifies areas where methane is emitting across the landfill waste surface and provides findings used for planning improvement activities. • Expansion of the landfill gas capture infrastructure in low gas capture locations. 36 new gas wells have been installed this year. • Reducing the active tipping face surface area to reduce potential for odour emissions. • Optimisation of the biofiltration system positioned along the rock wall/waste interface to minimise escape of landfill gas. • Maintaining evaporation of stored treated leachate on site through installation of additional evaporation units. • Installation of a hydrogen sulfide sensor and meteorological station in Tarago. Data will be correlated against instances of odour. These planned works, improved monitoring techniques, and installation of additional gas extraction technology in areas identified by drone surveillance, has achieved the highest gas capture records to date. Latest records show a 40% increase in captured gas (in July 2022 compared with the yearly average to date). Odour from the proposed ARC is assessed in the AQIA in Appendix O and Section 8.1.3v of the EIS. Veolia has included the following features in the ARC project design to minimise potential for release of odour into the environment: • Fitting of fast closing truck access doors at the tipping hall that remain closed unless a truck is entering or departing the tipping hall. • Installation of an air system that maintains the tipping hall at negative air pressure to help ensure air does not escape the tipping hall. • Air from the tipping hall is drawn into the furnace, where odour producing elements are destroyed, or filtered when the furnace is not operating. The AQIA (Appendix O) for the ARC has found that odour from the operation of the ARC will be negligible.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
Transport impacts	Increased numbers of trucks in Tarago, including the impact on noise and road safety. Increased rail movements and the construction of new rail infrastructure. Maintenance of local roads. Impacts on local traffic, particularly in relation to the climbing lane. The amount of regional waste being received.	Traffic and transport impacts are assessed in Appendix T and summarised in Section 8.5. Operation of the ARC project will be within the existing approved road traffic and rail limits for the Eco Precinct, and the traffic impact assessment has shown no material impacts are expected during the operation of the ARC. Veolia understands that local people may be concerned about the impact of trucks on local roads, particularly during construction, and has proposed mitigation measures for construction traffic, which can be found in Appendix T. These measures include: • Worksite traffic control. • Road pavement dilapidation survey. • Implementation of a procedure to facilitate emergency repair of damaged road repairs during the project construction period. • Dust control of road surfaces for any unsealed roads used for construction will be reviewed and adequately watered to mitigate dust generation impacts. • Establishment of a dedicated entrance road to the ARC to improve traffic flow and road safety at the entrance to and around the Eco Precinct. • Implementation of a construction traffic management plan to manage construction-related impacts on the local road network. The community expressed concerns about traffic delays on the hill climbing out of Crisps Creek due to slower moving heavy haulage vehicles transporting waste. Veolia investigated the impact of road widening to address this. Veolia undertook an independent traffic assessment, which found that the level of service is within limits, but that during construction delays would increase slightly during the peak hour. As this is a temporary impact during construction, widening the road is not proposed. Veolia has contributed over $4 million in towards repairing and maintaining the roads used surrounding the Woodlawn Eco Precinct, and will continue to do so following the construction and operation of the ARC.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
Visual impacts	Feedback that the design should fit into the local landscape. Positive feedback about: • The conceptual ARC design. • Mitigation of visual impacts to the local landscape from the conceptual design. • Potential for the ARC to have a tourist attraction element. • Incorporation of sustainable materials in the design.	Visual impacts of the ARC are assessed in Appendix BB and summarised in Section 8.13. The design report is provided in Appendix C. Veolia recognises the importance of considering aesthetic aspects of its EfW facilities' designs and has collaborated with leading architects globally to ensure this has been prioritised. In response to feedback from the community, the Veolia design team has reviewed the architectural design aspects of the ARC to visually integrate as much of the local landscape as possible to minimise visual impacts. Leading NSW architectural firm Nettletontribe, in collaboration with French architectural firm S'pace (a long-time architect for Veolia EfW facilities), has referenced the existing cultural, vegetation and terrain considerations to ensure they are reflected in the design of the facility, including landscaping. The Reference Design Report in Appendix C contains the design principles and alternative options considered for the architectural design of the ARC building. Veolia has also incorporated tour capabilities as part of the facility design which would allow interested visitors to engage in organised site tours. As part of these tours Veolia would be able to explain how the technology works and encourage visitors to practise sustainable waste behaviours and to reduce, reuse and recycle, to help move Australian waste management practices further up the waste hierarchy.
Water use and pollution	Water usage impacts on groundwater supply. Pollution impacting the quality of drinking water, from either groundwater or from household water tanks.	Impacts to groundwater and surface water and are assessed in Appendix U and Appendix V and summarised in Section 8.6 and 8.7 of this EIS. Veolia has an existing licence to use ground bore water, which provides the water necessary for the ARC. However, to reduce the use of bore water, the ARC has been designed to capture stormwater runoff for use in the process water system. Primarily, the plant will operate using rainwater runoff from the facility's roof and hard stand areas. Water from the roof will be stored in tanks and used for potable supply. The hard stand runoff will be stored in a purpose built pond for use in the ARC process. This rainwater supply will be supplemented by bore water from the Eco Precinct's existing water access licences during times of low rainfall. The ARC is designed to be as water-efficient as possible and will operate as a "zero discharge" facility, meaning all water and process wastewater will be kept on-site and reused. The groundwater assessment concluded that the project will have no adverse effects on the availability or quality of groundwater. Veolia made available the independent assessor of the AQIA at the Meet the Experts event, to ensure stakeholders could understand more about how impacts to drinking water are assessed.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
Social impacts and benefits	Positive and negative comments on the use of local amenities. Questions about community funding and request for more information about how the Veolia Mulwaree Trust works.	Social impacts and benefits are assessed in Appendix CC and summarised in Section 8.14. Veolia set up the Veolia Mulwaree Trust to enable financial support to worthwhile local community projects across 7 surrounding local government areas. At the time of this report, Veolia has contributed over $12 million to the local community through the Veolia Mulwaree Trust. This has been spread across over 1,500 community projects, ranging from parks and sporting centres to arts initiatives and scholarships. A full list of the support given through the Veolia Mulwaree Trust can be found on the Veolia Mulwaree Trust website. Veolia has delivered targeted advertising about its Trust in the Goulburn Post and makes available all trust information, including how to apply on its website. Veolia will continue its contributions to the community via the Trust, and if the proposed ARC project is successful, it will secure the longevity of the benefit.
Economic growth	Positive feedback about: • The number of new local jobs. • The new career opportunities for young people. • Veolia's intention to hire locally where possible. • The economic growth the project will provide to local businesses. Interest in the potential of partnerships with TAFE, schools and recruiters. Concerns about property price impacts from the project.	The economic benefits and impacts of the project are described in Appendix DD. Social benefits and impacts are described in Appendix CC. Around 84% of Veolia's workforce at the Woodlawn Eco Precinct is made up of people living in the Goulburn Mulwaree LGA. The ARC project will provide 300 jobs during construction and 40 during operation. Veolia intends to hire locally where possible and has also committed to hiring permanent apprenticeship roles as part of the project. Veolia has also taken into consideration the possibility of recruiting from local education centres such as TAFE for appropriate recruitment opportunities. The local housing economy was taken into consideration, and in response Veolia has referred to its EfW facilities internationally which reflect no negative impacts on property prices as a direct result of similar developments.
Safety and emergency response	How Veolia will manage safety and shut-down processes. Fire risks. Out of normal operating conditions.	Potential hazards and risks including fire safety have been assessed as part of this EIS in the Appendix EE and Appendix FF. Out of normal operating conditions (or 'OTNOC') has been assessed as part of this EIS in the AQIA in Appendix O. At the community open days and community information sessions, technical experts explained how the technology work and how Veolia would manage safety at its facility. This included the shut-down processes for the site. A hazards analysis and fire study have been carried out as part of this EIS. More information on this can be found in Section 8.16. Veolia acknowledged that this remains to be an area of interest for the community and will ensure it is covered in community collateral as part of the public exhibition.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
Feedstock and waste inputs	Quality of waste feedstock going into the ARC. Makeup of waste feedstock, particularly with regard to plastics and hazardous waste. Concern that waste input levels will increase beyond existing levels. Future waste volumes resulting in EfW redundancies. Potential reduction in recycling rates as a result of EfW.	An analysis of waste feedstock for the ARC is provided in Appendix I. An assessment of the current and projected waste makeup was conducted, which determined that the waste currently and expected to be accepted by Woodlawn is appropriate and safe to be used as feedstock for the ARC. Veolia will not need to increase its current waste limit as part of this project. No approval for an increase in the waste volumes transported to the Eco Precinct is included in the development application. As evidenced by its existing facilities globally, Veolia was able to demonstrate that the integration of EfW into the waste hierarchy does not impact recycling rates, and that rather countries which utilise EfW tend to increase their rate of recycling over time.
Residues and outputs	How emissions will be cleaned and managed. What chemicals will be present in emissions. Toxicity of bottom ash and residues. How bottom ash and residues will be managed, stored, transported.	A detailed description of EfW technology proposed for the ARC project is included in Section 4.4 of this EIS, including treatment of emissions and emission monitoring. Section 3.5 in this EIS and Appendix L(i) include analysis of alternative technologies. A detailed analysis of ash generated by the ARC is provided in Appendix E.
Project site location	Why this EfW facility is not being proposed in Sydney. Why the Government's infrastructure plan identifies Tarago as a preferred location for EfW.	The NSW government has identified the Southern Goulburn Mulwaree Precinct as a Priority Infrastructure Area for EfW technology development as part of the NSW EfW Infrastructure Plan. This incorporates the Eco Precinct, in which the ARC is proposed. The suitability of the site for inclusion as a Priority Infrastructure Area for EfW is not a relevant matter for the EIS to consider. Notwithstanding, the EfW Infrastructure Plan identifies the need for EfW infrastructure to manage NSW's waste, with 'at least one large scale regional EfW facility by 2030' (three by 2040). Veolia is a significant operator in the management of waste in Sydney, with the Eco Precinct receiving around 40% of Sydney's MSW. Veolia has identified the Eco Precinct as an ideal location for the ARC as it would enable a new technology to support existing waste management activities. Veolia is able to use existing rail transport infrastructure and infeed volumes to develop EfW infrastructure within current approval limits for receival of waste at the Eco Precinct. Locating the infrastructure at an existing waste management site will make use of existing infrastructure and help divert waste from landfill to a more sustainable waste management option, moving up the waste hierarchy away from landfilling and towards avoidance.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
EfW technology	How the technology works. How the ARC compares with incineration. How emissions will be filtered. How monitoring systems will work. Requirements for diesel in operation of the ARC. How much energy will be generated and where it will go. Concern around closure of other similar technology plants around the world, and why Veolia is proposing this technology for NSW.	A detailed description of EfW technology proposed for the ARC project is included in Section 4.4 of this EIS, including treatment of emissions and emission monitoring. Section 3.5 in this EIS and Appendix L(i) include analysis of alternative technologies. As part of early engagement activities, and following the first community open day, initial feedback from community members via feedback forms, door-knocking, and interaction with the CLC and TADPAI, were requests for more opportunities for residents to meet with the project team. There was particular interest to discuss EfW technology. Veolia responded by hosting an additional community open day, plus three community information sessions, which included detailed information on EfW technology and how the impacts are managed. Additional information has been made available on Veolia's website and in community updates, sent in the form of newsletters to residents who have signed up to receive them. Veolia also attended the annual Goulburn Show, the biggest show in the region. Veolia also arranged an online session connecting key community members with the residents living next to its UK reference site in Staffordshire. This allowed for additional information sharing. In response to additional community feedback, a Meet the Experts session was arranged in June 2022 to allow residents to meet the project team face-to-face, as well as independent experts undertaking the HHRA (Appendix P)and the AQIA (Appendix O) for the EIS. The session was designed to explain the methodology behind how the AQIA and HHRA are undertaken, and to further discuss how EfW technology works. As part of this session, Veolia also arranged for two tours of its facility for those interested in learning more about existing operations at the Eco Precinct. Nine people participated in the tours.
Circular economy	Positive feedback about: • Moving up the waste hierarchy by diverting waste from landfill. • Generating energy from a material that would otherwise go to waste. • The ability to recycle and reuse some of the materials.	Veolia has been pleased that stakeholders generally support the relationship of a circular economy to the proposal and understand the role of the ARC in sustainable waste management. Veolia also recognises the deep connection many people feel to their local environment and that many community members have already been practicing sustainable waste management themselves (eg via composting, reuse and recycling). Since commencing operations at the Eco Precinct, Veolia has evolved and expanded its footprint to create more sustainable and circular solutions for the benefit of the broader community (such as the use of landfill gas and solar installations to generate renewable energy and aquaculture and hydroponics food production). This project is necessary to help progress a circular economy at the Eco Precinct. The circular economy will continue to be a priority for the site and Veolia will continue to invest in solutions that bring benefits to both the environment and to local people.

Table 7.2 Key themes raised during engagement, Veolia's response and where these matters are addressed in the EIS

Theme	Focus of feedback	Veolia's response and where addressed in the EIS
Traditional landowner involvement	Desire for registered Aboriginal parties to be offered an opportunity to attend the site and be on Country in subsequent stages of the project. Further explore socio-economic and interpretive actions with Veolia.	Impacts to Aboriginal heritage and details of engagement with RAPs is provided in Appendix Z. Veolia conducted an in-person site visit with traditional land owners to the Eco Precinct on 21 November 2021. Veolia will continue to seek ongoing involvement of traditional landowners on the project and will look to increase Indigenous participation in the social and economic benefits of the ARC.
Consultation and communications	Positive feedback on the inclusion of tours to community open days, so that people could learn more about the site and current operations. Feedback that future meetings should be held at the Tarago Town Hall. Requests about Veolia using both colloquial and technical terminology in their materials to accommodate all levels of understanding. Requests for a longer public exhibition.	A detailed description of engagement for the project is provided in Appendix K. The first community open day was well received and Veolia scheduled a second open day at the Eco Precinct in response to feedback that local people wanted another opportunity to find out more about the project. It was suggested that the Tarago Town Hall be utilised for a future hosting location. Veolia has included this location in its engagement plan for the Public Exhibition phase of the project. In June 2022 Veolia held its Meet the Experts community event at the Tarago Town Hall in response to the above feedback. Veolia also held two pop-up sessions outside of grocery stores in Bungendore and Braidwood to engage more community members with the project. Veolia has listened to local people's feedback about how the project is described. Veolia's response included amending its language when talking with the community and members of the public to better reflect terminology that the community would use. Veolia also connected its CLC with members of its Staffordshire ERF reference site to allow a peer-to-peer discussion to take place. Public exhibition periods are determined by the DPE.
Planning process and approvals	Project timelines. The EIS planning process. Duration of the EIS public exhibition period. Impacts the EfW Infrastructure plan will have on the approval process.	Veolia developed a comprehensive Frequently Asked Questions response to help answer ongoing community questions around planning process timeframes. This can be found on the project website: https://www.veolia.com/anz/woodlawn-arc-frequently-asked-questions. Veolia has also developed graphics to help explain the steps that will be taken as part of the planning process, and updated it as the planning progresses. This is available on the project website and formed part of stakeholder and community presentations. It was also included in the project brochure. These can found on the project website: https://www.veolia.com/anz/information-provided-community-information-sessions. At the Meet the Experts event, Veolia also provided a detailed fact sheet, developed by an independent expert, which detailed more information about the planning process and tips on how to make a submission. This fact sheet has also been made available on the project website: https://www.veolia.com/anz/sites/g/files/dvc2011/files/document/2022/06/ARC%20EIA%20fact%20sheet.pdf Public exhibition periods are determined by the DPE.

7.6 Future engagement

Veolia has a long history of working closely with the local community, particularly in terms of the CLC and the Veolia Mulwaree Trust. If development consent is received for the project, Veolia will continue with ongoing engagement activities with both stakeholders and community members throughout the public exhibition of the EIS, the assessment and determination phase, and construction and operation of the ARC.

Veolia will continue to collect feedback and monitor community feedback through the channels set up as part of the project consultation and, in the same way that the engagement approach was adopted during the EIS preparation consultation, ongoing engagement activities will be adjusted based on feedback from stakeholders.

Principal engagement and consultation activities during and beyond the EIS stage are outlined in Sections 7.5.1, 7.5.2 and 7.5.3.

7.6.1 Consultation during public exhibition of the EIS

During the public exhibition period, the community and other stakeholders will be able to review the EIS and make a written submission to the Department for consideration in its assessment of the proposal.

As part of this, Veolia will undertake further consultation with the community and stakeholders using several channels to keep them informed about the proposal and the opportunity to provide a submission. Veolia also aims to present the EIS to the community and other stakeholders in an easy-to-understand format.

Display of the EIS

Electronic copies of the EIS will be available to view on:

- The NSW Planning Portal for Major Projects (https://www.planningportal.nsw.gov.au/major-projects); and
- The Veolia Woodlawn ARC project website (https://www.veolia.com/anz/TheArc).

Veolia will make physical copies of the EIS available for viewing at publicly accessible locations across the region. Veolia will hold drop-in sessions, attended by project team members who will be available to answer questions and provide information to community members and stakeholders about how to make a submission.

Community information sessions

Veolia will undertake two dedicated community drop-in information sessions where it will share the findings of the EIS with attendees. Veolia will ensure its project representatives, as well as independent experts, are available at these sessions to meet the community and answer questions. One session will be held in Tarago, to capture immediate neighbours, and the other will be held in Goulburn. The community will be advised of these sessions in advance to ensure maximum participation. This advertising will include (but is not limited to) a letterbox drop, advertisements in local print media and on social media, newsletters, flyers and the project website. All information presented to community members on the day will be made available to the community via the project website.

Veolia will also deliver a virtual information session to provide further accessibility to project information. A digital Q&A will be incorporated into the session.

Community pop-up sessions

Veolia will attend weekly pop-up events during the exhibition period, in high-footfall areas of neighbouring communities, such as in libraries and outside shopping centres. Veolia project team members will attend these sessions, to answer questions. Project information (such as information boards, newsletters and fact sheets) will be available to attendees and these materials will also be shared on the project's website.

The community will be advised of these pop-up events in advance of them taking place to ensure maximum participation. This advertising will include (but is not limited to) a letterbox drop, ads in local papers and on social media, newsletters, flyers and the project website.

Supporting information to help understand the proposal

To enhance understanding of the proposal, Veolia will develop written information in an easy to understand format. This will ensure technical detail can be understood by a range of community members. This will include:

- Project fact sheets – fact sheets based on topics of most interest to the community will be developed and shared as part of the public exhibition. These will translate technical detail into plain terminology and will be made available in printed copy and online via the project website. Key topics will include (but are not limited to):
    - air quality;
    - human health;
    - how EfW Technology works (including safety and the management of outputs); and
    - how to make an EIS submission.
- Community Guide to the EIS – a Community Guide to the EIS will explain the project's needs, the EIS process, high-level results of the EIS studies, and how to make a submission. This guide will be available in printed copy at face-to-face engagement sessions and online via the project website.

Letterbox drop

Veolia will letterbox drop the community surrounding the Eco Precinct to advise them of the public exhibition and the events that will be facilitated through this period, so that community members are aware and can participate.

Project website

To support the public exhibition stage, Veolia will update the project website, where people can access the EIS, watch an explanatory video, view factsheets and presentations and submit questions. There will also be a link to the DPE Planning Portal, where formal submissions to DPE can be made.

The website will also have information on upcoming community events and information sessions.

Proposal advertising, notifications and updates

To promote the public exhibition of the EIS, Veolia will inform stakeholders through a variety of tools, either in person or via digital platforms, including:

- project website updates;
- emailing its distribution list;
- media advertising such as in the Goulburn Post, Tarago Times, and Goulburn Express;
- social media advertising;
- posters and flyers displayed in public spaces; and
- stakeholder briefings.

Project contacts

The existing 1800 number, project email address and mailing address will continue to be resourced and published on all communication materials.

Consideration of stakeholder and community feedback

At the completion of the display period, DPE will provide Veolia with a copy of all submissions and a summary of issues raised. Veolia will prepare a submissions report responding to the issues raised, which will be made available for viewing on the DPE website. If changes to the project need to be made, an amendment report would also be prepared.

7.6.2 Consultation during assessment of the proposal

During the assessment period and prior to determination, Veolia will continue to provide updates to interested parties about the progress of the proposal. This will be through newsletters, letters, stakeholder meetings, briefings, and the project website. If approved, the following approach will be taken post approval.

A detailed communication and engagement strategy will be developed to support stakeholder engagement prior to and during the construction phase of the project and will be in accordance with relevant consent conditions. The focus will be on providing the community and stakeholders with:

- a high level of awareness of processes and activities associated with construction of the ARC;
- timely and accurate information and notifications to stakeholders about works that may impact them;
- mechanisms to lodge construction-related questions or complaints; and
- opportunities for feedback and input.

The 1800 number and email address will continue to be available and monitored during construction. Targeted consultation methods such as letters, notifications, signage, door knocking, and stakeholder meetings and briefings will also continue to occur.

In addition, Veolia will continue to inform the broader community about the project benefits and work to continue building trust in the project. Community newsletters, updates to the ARC website and articles in the local newspaper, the Tarago Times, will also continue. Community information sessions or site open days will be held as needed.

Veolia will continue its community partnerships and investment program, including the Veolia Mulwaree Trust and the quarterly CLC meetings. If there is a community interest, a dedicated ARC community committee will also be established.

Veolia will hold special events such as a job fair, site open day and other focused events to provide additional information about the project if there is an appetite within the local community and stakeholders.

7.6.3 Engagement approach during operations

A detailed communication and engagement strategy will be developed for the site’s ongoing operations, with a focus on demonstrating the significant role for the facility in minimising waste and supporting a circular economy. The strategy will build awareness of the project benefits, demonstrate project outcomes, outline timeframes and mechanisms to report key data (for example air quality) openly and transparently, respond to queries or concerns in a timely manner, and continue to build strong relationships with the community.

In developing this strategy, consideration will be given to existing operations at Woodlawn, with community and stakeholder engagement required regarding site operations in their entirety.

Likely activities will include:

- updates to the Woodlawn ARC website;
- maintaining feedback channels including a project email address and phone number;
- stakeholder meetings and site tours;
- community newsletters; and
- open days on site, such as education days for students.

Veolia welcomes community engagement and feedback and will appropriately resource its team to support enhanced community engagement. An educational centre at the ARC will encourage site visitors and raise awareness on the importance of diversion of waste from landfill. Veolia will continue its community partnerships and CLC, and will investigate if an additional committee for the ARC needs to be established.

Chapter 8

Assessment of impacts

8 Assessment of impacts

8.1 Air quality and odour

8.1.1 Introduction

An air quality impact assessment (AQIA) has been prepared by EMM and is provided in Appendix O. It has been prepared in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2017).

i Assessment guidelines and requirements

The SEARs require a quantitative assessment of the likely air quality and odour impacts associated with the project. The SEARs also require that the assessment consider cumulative air quality and odour impacts associated with the existing Eco Precinct operations and surrounding developments, including the Jerrara Power Energy from Waste Facility. It is noted that the application for the Jerrara project was withdrawn on 28 September 2021; therefore cumulative impacts have not been considered. The relevant SEARs and how they are addressed, are summarised in Appendix A and Section 1.2 of the AQIA (Appendix O).

In accordance with the SEARs, the AQIA has been prepared in accordance with the following guidelines:

- *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (DEC 2007);
- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the Approved Methods for Modelling) (EPA 2017); and
- *Assessment and Management of Odour from Stationary Sources in NSW* (DECC 2006).

The AQIA has also referenced European guidance from the BREF and the IED.

ii Summary of assessment methods

The AQIA follows the Level 2 assessment approach detailed in the Approved Methods for Modelling.

Existing ambient air quality was determined using DPE and ACT air quality monitoring stations within the region, dust deposition gauges and a high volume air sampler at and around the Eco Precinct.

To quantify emissions from the ARC building, three emission scenarios were developed:

- Scenario 1 – reference case – average emissions. This scenario used real-world emission data from a comparable Veolia owned ERF in Staffordshire in the United Kingdom, referred to as the 'reference facility' as required by the EfW Policy Statement. The reference facility data is considered to be sufficiently representative of the project, as it features similar technology (ie moving grate and emission control technology) and similar feedstock. This is discussed further in Section 6.3. Scenario 1 used average emission data from Staffordshire and represents the emissions expected from the ARC during normal operations.
- Scenario 2 – reference case – maximum emissions. This scenario took the single worst case emission concentration for each pollutant recorded in a year of operations at Staffordshire, factored these upwards and then applied that rate of emission for every hour of the operational year. As such it is a highly conservative scenario for representing maximum emissions and is likely well beyond what is expected at Woodlawn.

- Scenario 3 – regulatory case – a scenario which assumes that the ARC is generating emissions at the upper limit set in the EfW Policy Statement for every hour of the operational year. This represents the theoretical worst case emissions scenario that would be legally permitted in NSW.

These three emission scenarios were adopted in the dispersion modelling. Dispersion modelling was undertaken using the CALPUFF modelling system. The model considered cumulative impacts by taking into account the combined effect of background air quality and model predicted impacts from air pollutant emission sources at the Eco Precinct, including existing approved sources, and new sources associated with the project. Model inputs were reviewed by technology provider Fichtner Consulting Engineers Limited to confirm that inputs were representative of the operation of the adopted reference plant, Staffordshire ERF, and that the modelled emission rates for the regulatory case have been calculated assuming operation of the plant at the emission standards specified in the EfW Policy Statement (refer to Appendix E of the AQIA in Appendix O). Finally, modelling results were evaluated against pollutant-specific impact assessment criteria.

8.1.2 Existing environment

Sensitive receptors surrounding the Eco Precinct include rural properties, with the closest receptor over 4 km from the project to the south-west. The village of Tarago is located approximately 6 km to the east and includes residential properties and other sensitive community land uses such as schools and recreation areas.

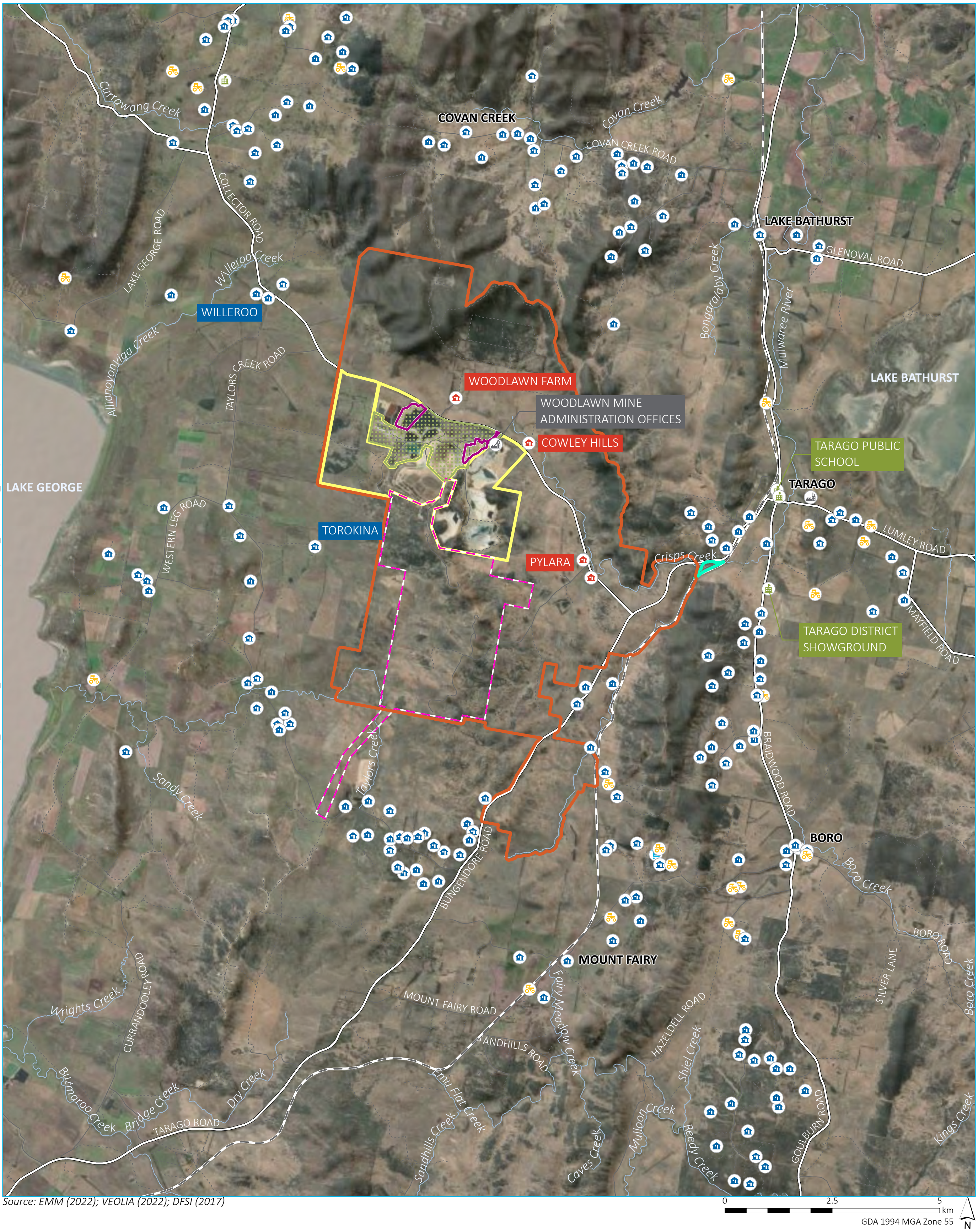
To assess potential air quality impacts from the project, a range of sensitive land uses were selected as discrete model assessment locations. A summary of assessment locations by type and the closest distance (measured as closest distance to the ARC building) is provided in Table 3.1 of the AQIA (Appendix O). Assessment locations are shown in Figure 8.1.

i Meteorology and atmospheric dispersion

Meteorological conditions were analysed from an automatic weather station at the Eco Precinct and supported by data from nearby automatic weather stations operated by the Bureau of Meteorology at Goulburn Airport and Canberra Airport.

The 2018 dataset was selected as representative for modelling as it possessed a data capture rate of 99% for all parameters and annual wind roses were consistent in wind direction, average wind speed and percentage occurrence of calm winds (<= 0.5 m/s) with other years. The 2019 and 2020 calendar years were specifically excluded due to the occurrence of extensive drought and bushfire events which resulted in elevated concentrations of recorded PM_{10} and $PM_{2.5}$, which are not representative of a typical year.

The annual wind rose for data recorded by the Eco Precinct automatic weather station is presented in Figure 8.2. The recorded wind direction patterns are east-west aligned during both day and night periods, however the occurrence of westerly winds is highest during the day. The average wind speed during the day was 3.8 m/s compared to 3.0 m/s at night-time, while the percentage of calms is higher at night.



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Source: EMM (2022); VEOLIA (2022); DFSI (2017)

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm

Assessment location

- Agriculture
- Community/school
- Commercial
- Industrial
- Residential
- Veolia

- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Air quality assessment locations

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.1

EMM creating opportunities

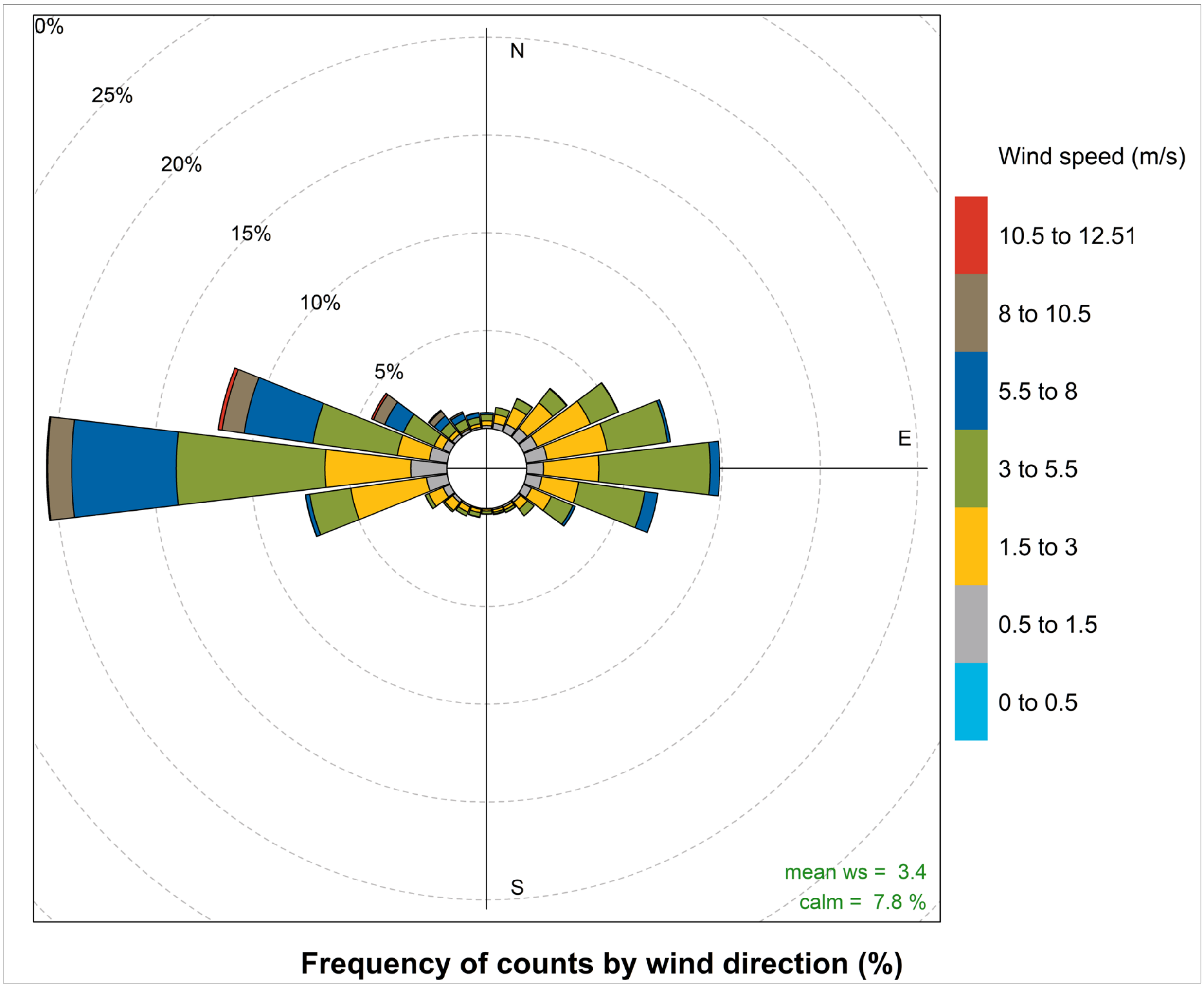


Figure 8.2 Recorded wind speed and direction – Eco Precinct automatic weather station 2018

Atmospheric dispersion modelling was undertaken using the CALMET/CALPUFF model suite. The data was joined by surface observations from the three automatic weather stations above to provide real-world observations and to improve the accuracy of the wind field. The Air Pollution Model was used to generate the upper air data for each hour of the model run period for input into CALMET. An overview of the meteorological modelling is presented in Appendix B of the AQIA.

ii Existing ambient air quality

Existing sources of pollutants that contribute to ambient air quality include the Eco Precinct (including Woodlawn Mine) and Crisps Creek IMF, which are identified on the National Pollutant Inventory (NPI 2021) and EPA (2021) environment protection licence (EPL) databases. Emissions from these existing sources have been quantified and modelled in combination with predicted emissions from the project.

Other sources of emissions that influence background air quality include:

- dust entrainment due to vehicle movements along unsealed roads and sealed roads with high silt loadings;
- dust emissions from agricultural activities, in particular livestock operations;
- fuel combustion-related emissions from on-road and non-road engines;

- wind generated dust from exposed areas within the surrounding region; and
- seasonal emissions from household wood burning for heating during winter.

The Eco Precinct's air quality monitoring network (which includes a meteorological monitoring station and four dust deposition gauges), Woodlawn Mine high volume air sampler and regional monitoring resources (NSW DPE air quality monitoring stations) have been accessed to determine background pollutant concentrations. The modelling has adopted the 2018 year for background data, as 2019 and 2020 were highly affected by bushfires. The use of 2018 as ambient background is considered conservative for cumulative assessment purposes, with adopted concentrations summarised below:

- Particulate matter concentrations – recorded particulate matter (less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}) and less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$)) concentrations follow a similar daily-varying trend over the analysed period. Of particular note, the recorded $PM_{2.5}$ concentrations are higher in the winter months of each year which is considered reflective of emissions from domestic wood heaters. The 2018 calendar year exhibits elevated concentrations of PM_{10}, which is considered reflective of intensifying drought conditions across eastern Australia.
- Oxides of nitrogen (NO_x), including nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and carbon monoxide (CO) concentrations – generally, the results of NO_2, SO_2 and CO at all monitoring locations well below the applicable impact assessment criteria in all years (with some exceptions attributable to bushfires in 2019 and 2020).
- Total suspended particulate (TSP) concentrations – an annual average TSP concentration consistent with the 2018 background period was determined based on a review of data for the period 2017–2021. A TSP background concentration of 23.8 µg/m³ is adopted.
- Dust – Veolia records dust deposition at four dust deposition gauges. The annual average dust deposition level for 2018 was 2.4 g/m²/month and is adopted as background dust deposition for cumulative impact assessment purposes.
- Other pollutants – there are no significant sources of hydrogen fluoride (HF) in the local area and ambient background levels are therefore assumed to be negligible.

The Woodlawn Mine may generate emissions of lead in the handling and processing of ore and waste rock material. Operations at this site were modelled explicitly for cumulative impact assessment purposes. Ambient background lead levels, excluding the contribution of the Woodlawn Mine are assumed to be negligible.

8.1.3 Potential impacts

i Construction

Construction of the ARC is anticipated to take approximately three years. Sources of air pollution during the construction phase are likely to be fugitive releases of particulate matter, which includes dust from earthworks, wind erosion of exposed areas, wheel-generated dust from the movement of plant and vehicles, and pollutants associated with the combustion of diesel fuel (particulate matter, oxides of nitrogen (NOx), volatile organic compounds (VOC)).

Throughout the three-year construction period, the intensity of emissions is expected to be lower than the operational phase of the project. Furthermore, construction-related air pollution emissions will be generated at the development footprint, which benefits from a substantial buffer of Veolia-owned land, distant from surrounding sensitive receptors. Consequently, air quality impacts from the construction phase will be lower than the operational phase and have not been specifically quantified further.

ii Operation

Operation of the project will introduce the following air pollutant emissions sources to the Eco Precinct:

- ARC building stack emissions – release point of residual air pollutant emissions from the FGT system;
- truck movements – including the transportation of APCr from the ARC building to the encapsulation cell, transfer of IBA to the Bioreactor and the diversion of up to 380,000 tpa of incoming waste deliveries from Crisps Creek IMF to the ARC receiving hall;
- fugitive emissions from the handling and storage of material at the IBA area; and
- diesel fuel combustion by mobile plant and equipment and the auxiliary diesel burner.

Mitigation measures that have been incorporated into the design of the ARC to mitigate emissions include:

- a fully enclosed tipping hall with fast opening doors and negative pressure extraction and odour filtration to minimise odour emission release;
- the control of NO_x emissions through selective non-catalytic reduction, as well as the injection of NH_3 in the post-combustion chamber;
- the injection of hydrated lime to neutralise acid gas formation;
- the injection of activated carbon to adsorb dioxins/furans and other contaminants including heavy metals;
- diversion of all flue gas through a baghouse containing fabric filter bags to remove particulates (as APCr); and
- the handling and processing of IBA material within a semi enclosed building.

A detailed review of the mitigation measures proposed for the project has been undertaken as part of the EIS (Appendix J of the AQIA). The reviews concluded that the measures proposed for implementation at the project are aligned with accepted BAT measures for air pollutant emission control wherever practicable to do so.

In order to quantify emissions from the ARC building, three emission scenarios were developed as described in Section 8.1.1 in accordance with the EfW Policy Statement. The results of each scenario are described below.

a Scenario 1 ARC building – reference case average emissions

The reference case scenarios are derived from air pollution emissions monitoring data from the reference facility in Staffordshire, United Kingdom. Data for the reference facility for the 2017 calendar year was adopted. Twelve months of unprocessed 30 minute average data from the reference facility's continuous emission monitoring system was analysed.

ARC building stack emissions for the reference case average emissions scenario assumes the combination of *average* stack emission parameters and the *average* measured emission concentrations from the 2017 Staffordshire ERF emissions data. These were combined with design data on the projected volume of emissions from the ARC project

The calculated ARC building emission rates for the reference case average emissions scenario are presented in Table 7.6 of the AQIA.

b Scenario 2 ARC building – reference case maximum emissions

Scenario 2 assumes the following:

- the combination of *maximum* stack emission parameters and the *maximum* (100^{th} percentile) measured emission concentrations from the 2017 Staffordshire ERF emissions data; and
- to account for interannual variability in maximum concentrations, the derived emission rates for Scenario 2 are upscaled by the pollutant-specific scaling factors as set out in Appendix O.

By taking the worst-case result from one year's operations at Staffordshire and applying them across every operational hour at the ARC, the results obtained from dispersion modelling for Scenario 2 should be viewed as a highly conservative upper bound estimation of potential air quality impacts from the project.

c Scenario 3 ARC building – regulatory case scenario

The regulatory case scenario has been developed in order to assess the performance of the ARC building operating at the emission standards specified within the EfW Policy Statement. In order to quantify emissions from the ARC building for the regulatory case scenario, the EfW Policy Statement emission standards have been paired with the expected stack conditions adopted for the reference case scenario.

d Start-up/shutdown emissions

The SEARs for the project specifically request the modelling of 'worst case' emission scenarios associated with unexpected conditions such as a system trip or emergency shutdown. These periods are referred to as "other than normal operating conditions" (OTNOC).

A review of OTNOC at Staffordshire in 2017 indicated 24 separate occurrences of downtime, of which:

- there were eight occurrences of large objects blocking ash dischargers which are deemed as avoidable operational outages in the context of Woodlawn due to additional waste quality control procedures at the Veolia transfer stations;
- there were two mechanical/electrical events that were classed as avoidable in the context of Woodlawn through consideration of equipment redundancy and good operation and maintenance practices;
- there were three external electrical grid faults which are classed as unavoidable;
- there were two insurance testing events, which must be undertaken and are classed as unavoidable; and
- there were nine system servicing outages, which must be undertaken and are classed as unavoidable.

Consequently, Veolia consider that there were ten downtime events at the Staffordshire ERF in 2017 and that these events could occur at the project. However, Veolia consider that the likelihood of occurrence can be controlled and minimised at the project through the consideration of equipment redundancy and good operation and maintenance practice.

The 2017 Staffordshire CEMS data captures periods of emissions during some phases of OTNOC (eg initial system shutdown, stabilised start-up and abnormal spikes due to waste feed). Therefore it is considered that the conservative assumptions in the emission calculations included in Scenario 2 (reference case – maximum emissions) provides an appropriate representation of emissions during OTNOC periods. This scenario utilises the 100^{th} percentile emission rate for each pollutant from the 2017 Staffordshire data, then scaled upwards to account for interannual variability, and therefore is a highly conservative scenario.

It is noted that the FGT system, including the fabric filter system remains operational during start-up and shut-down periods. Further, there is no bypass stack designed into the ERF for an alternate point of emissions release. Therefore, all emissions generated during periods of start-up and shutdown, including those by the auxiliary diesel burner, are captured and controlled by the FGT system and represented in the emission rates derived for modelling.

As noted previously, the project design will feature diesel-fired auxiliary burners to assist with raising and maintaining furnace temperature at 850°C during start-up/shut-down periods.

While the activation of the diesel fired auxiliary burners will be very infrequent, emissions during this period have been reviewed for comparison with the quantified emission rates from the ARC building stack and are fully detailed in the AQIA at Appendix O.

The results indicate that the emission rates from the diesel combustion are notably lower than the emission rates for the three ARC building stack scenarios.

e Project fugitive particulate matter emissions

In addition to emissions from the ARC building, other potential sources of fugitive particulate matter emissions include:

- wheel generated dust from waste trucks entering the site (sealed access road);
- wheel generated dust from trucks transporting APCr from the ARC to the encapsulation cell (unsealed internal movements);
- material handling, including waste tipping, unloading and spreading APCr, transfer and handling of IBA and IBAA;
- screening/processing of IBA;
- loading and dispatch of IBAA; and
- wind erosion from the encapsulation cell.

Full details on emission calculations for existing and approved emission sources is presented in Appendix C of the AQIA.

f Odour emissions

The operation of the ARC is not expected to add to the existing odour emissions from the Eco Precinct. There would be no expected increase in odour emissions from the Bioreactor or MBT facility due to the ARC. Waste feedstock receival will be managed to minimise odour. The following measures are included in the design to minimise odour emissions:

- waste feedstock for the ARC will be sourced from existing approved waste transported from Crisps Creek IMF; and
- tipping hall, which is the receival point for waste feedstock, will comprise an enclosed hall where waste feedstock is received by truck from the Crisps Creek IMF. The tipping hall will:
  - be equipped with automatically operated fast closing doors for truck entry and exit to minimise escape of odour;

- be maintained under negative air pressure during operation, with air from the hall being drawn into the furnace; and
- be equipped with an odour extraction and filtration system for periods when the furnace is not operating.

These measures will minimise the potential release of odour to the environment. However, to ensure the modelling and assessment is highly conservative, the ARC has been included as a potential odour source in the model to account for possible odour emissions from trucks entering the tipping hall.

Odour emission rates from the tipping hall were calculated based on the average measured odour concentration for fresh waste (5,640 odour units (ou)) taken from the most recent independent odour audit (TOU 2021). To assess the potential odour impacts from the ARC, a future cumulative scenario is presented, which adds the potential additional odour from the ARC to the existing operations of the Bioreactor and MBT facility. The odour emission inventory for existing sources is described in Appendix C of the AQIA.

iii Dispersion modelling – incremental results

Dispersion modelling was undertaken using the CALPUFF modelling system. Model source locations are presented in Appendix C of the AQIA. Incremental concentrations are defined as the combination of ARC building stack, ARC fugitive emissions (IBA, IBAA and APCr related emissions) and emissions from approved Eco Precinct operations (ie Bio Reactor, MBT, BioEnergy Power Station and flare).

The maximum predicted incremental ground level concentrations for modelled pollutants across all assessment locations are detailed in the AQIA at Appendix O and are summarised in Figure 8.3 which provides the maximum predictions across all assessment locations (excluding receptors on Veolia-owned) represented as a proportion of the appropriate criterion. The exception is hydrogen fluoride (HF), which is presented as the highest across agricultural and vineyard assessment locations. The incremental emissions from the three scenarios are a very small percentage of the total impact assessment criteria for all pollutants, and differ little from the current emissions from the Eco Precinct.

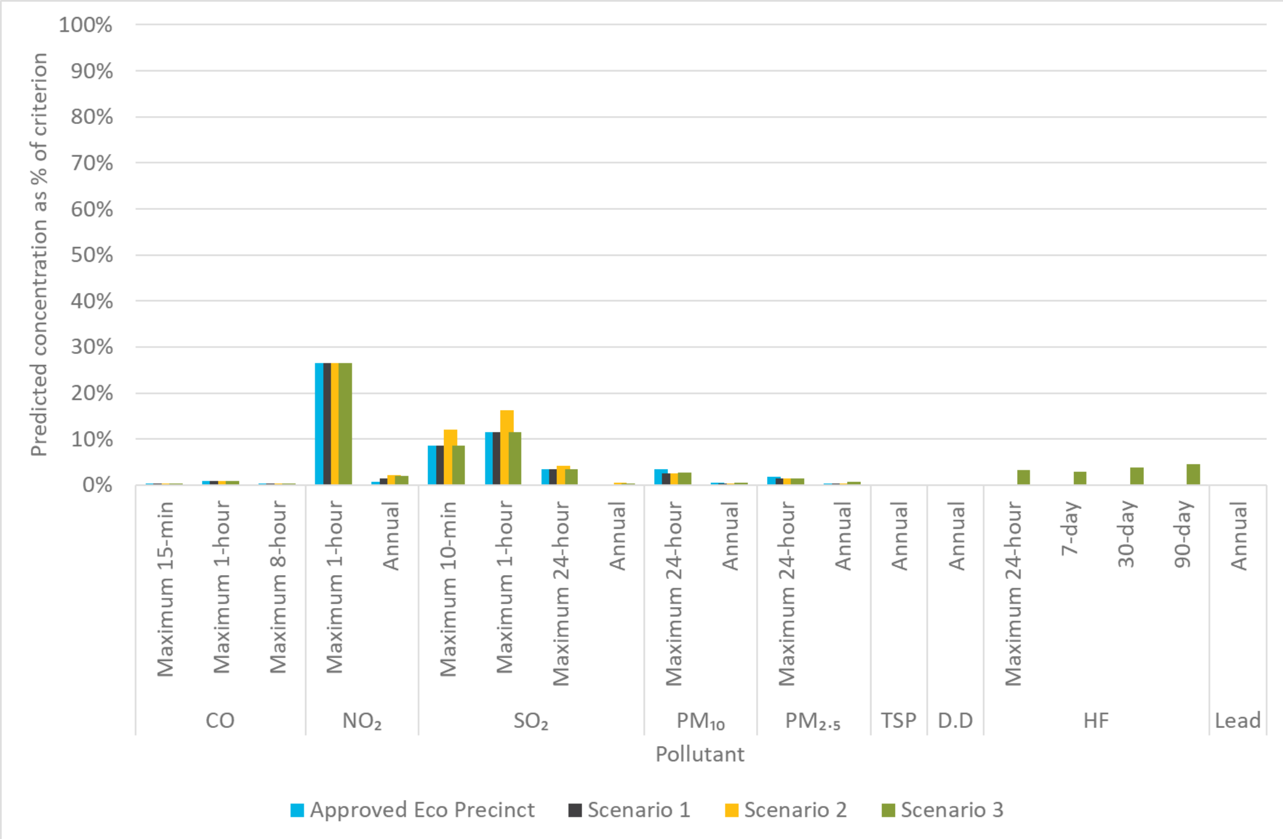


Figure 8.3 Maximum predicted incremental concentrations (ARC building stack + ARC fugitives + approved Eco Precinct sources) across sensitive assessment locations by criteria pollutant, expressed as percentage of relevant impact assessment criterion

The results in Figure 8.3 show that the introduction of the project to the Eco Precinct will not significantly change air quality impacts relative to those experienced under the current approved operations.

The maximum predicted incremental GLCs for principal and individual toxic air pollutants across all assessment locations are presented in Figure 8.4. The maximum predictions are presented as the highest prediction at sensitive assessment locations. The increment from the project for all three scenarios comply with the impact assessment criteria for all pollutants.

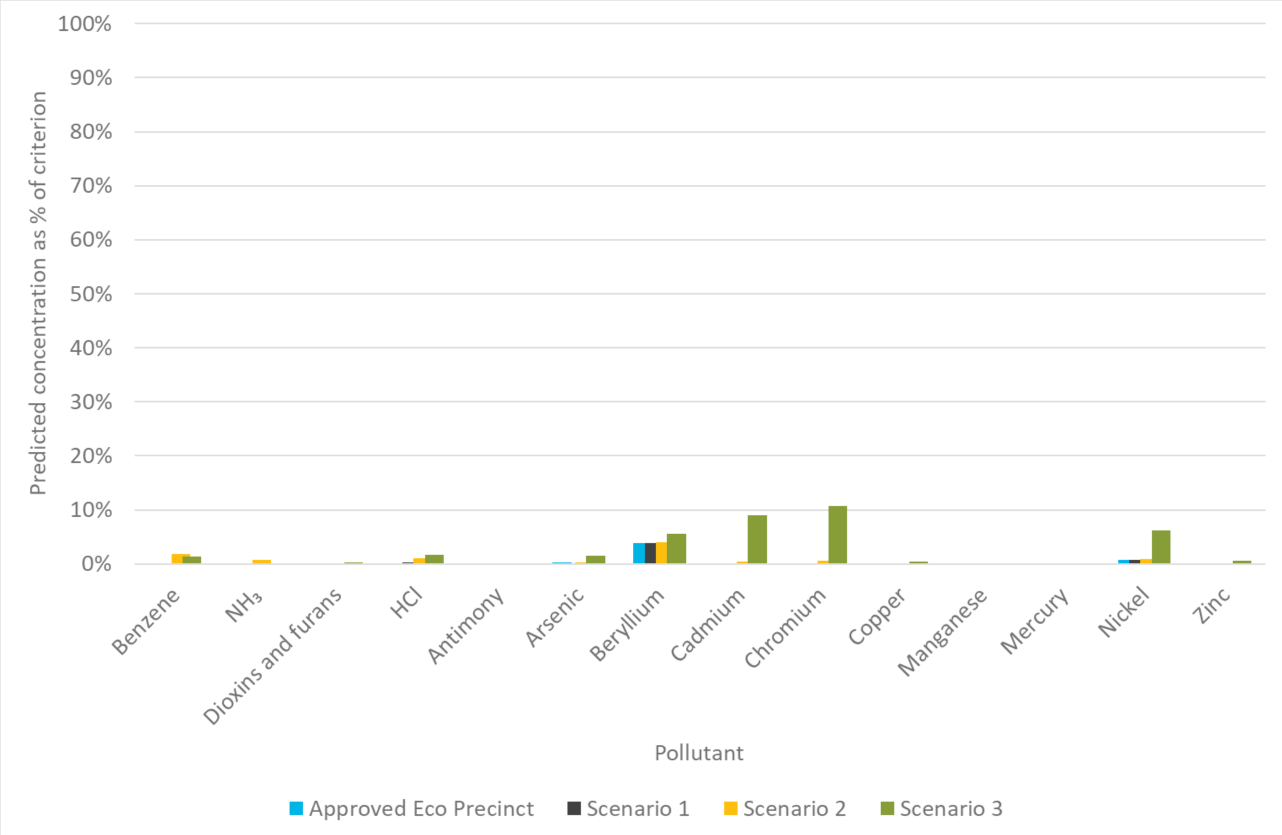


Figure 8.4 **Maximum predicted incremental concentrations (ARC building stack + ARC fugitives + approved Eco Precinct sources) at sensitive assessment locations for principal and individual air toxics, expressed as percentage of relevant impact assessment criterion**

iv Cumulative impacts

To assess cumulative impacts, the project-only increments (ARC building stack + ARC fugitives + approved Eco Precinct) have been combined with model predictions for the neighbouring Woodlawn Mine and the ambient background concentrations.

Predicted cumulative concentrations and deposition rates from the three modelled scenarios were then collated, and the maximum predicted results across the surrounding sensitive assessment locations were extracted and are shown on Figure 8.5.

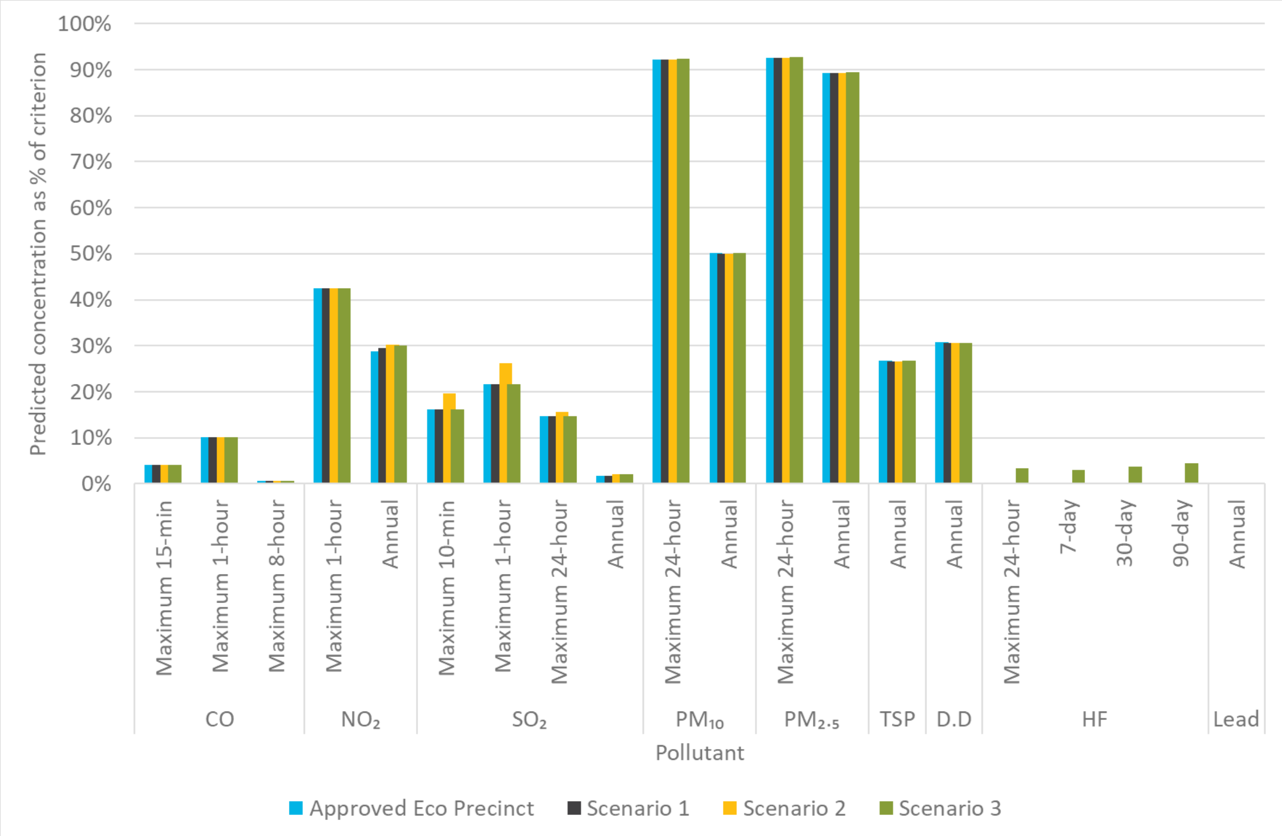


Figure 8.5 Maximum predicted cumulative concentrations (ARC building stack + ARC fugitives + approved Eco Precinct sources + Woodlawn Mine + background) across sensitive assessment locations by criteria pollutant, expressed as percentage of relevant impact assessment criterion

The predicted results for the three modelled scenarios are the maximum predicted results across the surrounding sensitive assessment locations. All predictions comply with the relevant impact assessment criteria. The results also demonstrate that the predicted cumulative impact results presented for the three project scenarios are not significantly different from the results presented for the currently approved operations at the Eco Precinct. This indicates the following key points:

- the introduction of the project will not significantly change air quality impacts currently associated with the Eco Precinct; and
- relative to ambient background concentrations, air quality impacts associated with the Eco Precinct are minor at surrounding sensitive assessment locations.

From the predicted cumulative results, all concentrations and depositions rates are below the applicable impact assessment criterion at all surrounding sensitive assessment locations. Accordingly, the project will not significantly change air quality impacts currently associated with the Eco Precinct. Further, relative to ambient background concentrations, air quality impacts associated with the Eco Precinct are minor at surrounding sensitive assessment locations.

v Odour

There are no instrument-based methods that can measure an odour response in the same way as the human nose. Therefore "dynamic olfactometry" is typically used as the basis of odour quantification by regulatory authorities. Dynamic olfactometry is the measurement of odour by presenting a sample of odorous air to a panel of people with decreasing quantities of clean odour-free air. The panellists then note when the smell becomes detectable. The correlations between the known dilution ratios and the panellists' responses are then used to calculate the number of dilutions of the original sample required to achieve the odour detection threshold. The units for odour measurement using dynamic olfactometry are "odour units" (ou) which are dimensionless and are effectively "dilutions to threshold".

The odour nuisance level can be as low as 2 ou and as high as 10 ou (for less offensive odours). An odour assessment criterion of 7 ou is likely to represent the level below which 'offensive' odours should not occur. The *Technical Framework for Assessment and Management of Odour from Stationary Sources in NSW* (NSW DECC 2006) recommends that, as a design criterion, no individual should be exposed to ambient odour levels of greater than 7 ou.

The EPA (2017) prescribes odour goals which take into account the population density for a particular area. The most stringent odour goal of 2 ou is acceptable for the whole population and therefore generally considered appropriate for built-up areas. Odour goals are only applied for odour impact assessment (ie comparing against modelling predictions) and are not used, for example, to determine compliance for an existing facility. A summary of the EPA's population-based odour assessment criteria is presented in Table 8.1.

Table 8.1 Impact assessment criteria for complex mixtures of odorous air pollutants

Population of affected community	Odour units (ou), nose response time average, 99^{th} percentile
~ 2	7
~ 10	6
~ 30	5
~ 125	4
~ 500	3
Urban (2000) and/or schools and hospitals	2

Previously, the odour impact assessment prepared for the Woodlawn Expansion Project (Heggies 2010) adopted an odour goal of 6 ou (99^{th} percentile), based on the number of sensitive receptor locations in the immediate vicinity of the Eco Precinct. The annual independent odour audits (ie TOU 2021) have also adopted 6 ou as an odour performance goal for the Eco Precinct, used for compliance with condition 7 (f) of Schedule 4 of the Project Approval. As the criteria are 99^{th} percentile, it means that for 1% of the year (ie 88 hours) the odour could be worse than the criteria.

For consistency with historical studies completed at the Eco Precinct, the AQIA has adopted an odour impact assessment criterion of 6 ou.

As reported in the most recent independent odour audit for the Eco Precinct (TOU 2021), there were 98 odour complaints received between 1 April 2020 and 31 April 2021. Odour from the period 1 April 2020 to 1 April 2021 has been attributed to high rainfall conditions over the audit period, which impacted the efficiency of the landfill gas containment and extraction at the Bioreactor, increasing the formation of fugitive landfill gas emission pathways from the void surface.

It is acknowledged that odour is a key matter identified in relation to the project during stakeholder engagement. For conservative purposes, and to reflect the recent increase in odour complaints received from the local community and level of concern identified during stakeholder engagement, predictions against an odour goal of 2 ou are also considered for the project.

CALPUFF was used to model odour in accordance with the Approved Methods for Modelling. The instantaneous perception of odours by the human nose occurs over very short timescales (~ 1 second), but dispersion model predictions are typically made for a one hour averaging period. To estimate the effects of plume meandering and concentration fluctuations perceived by the human nose, it is possible to multiply dispersion model predictions by a correction factor called a "peak-to-mean ratio" (P/M60) which is defined as the ratio of peak 1 second concentrations to mean 1 hour average concentrations. The predicted ground level odour concentrations are presented in Table 8.2, with the maximum concentration across each assessment location type shown.

Table 8.2 Predicted ground level concentrations of odour (1 second average [nose response])

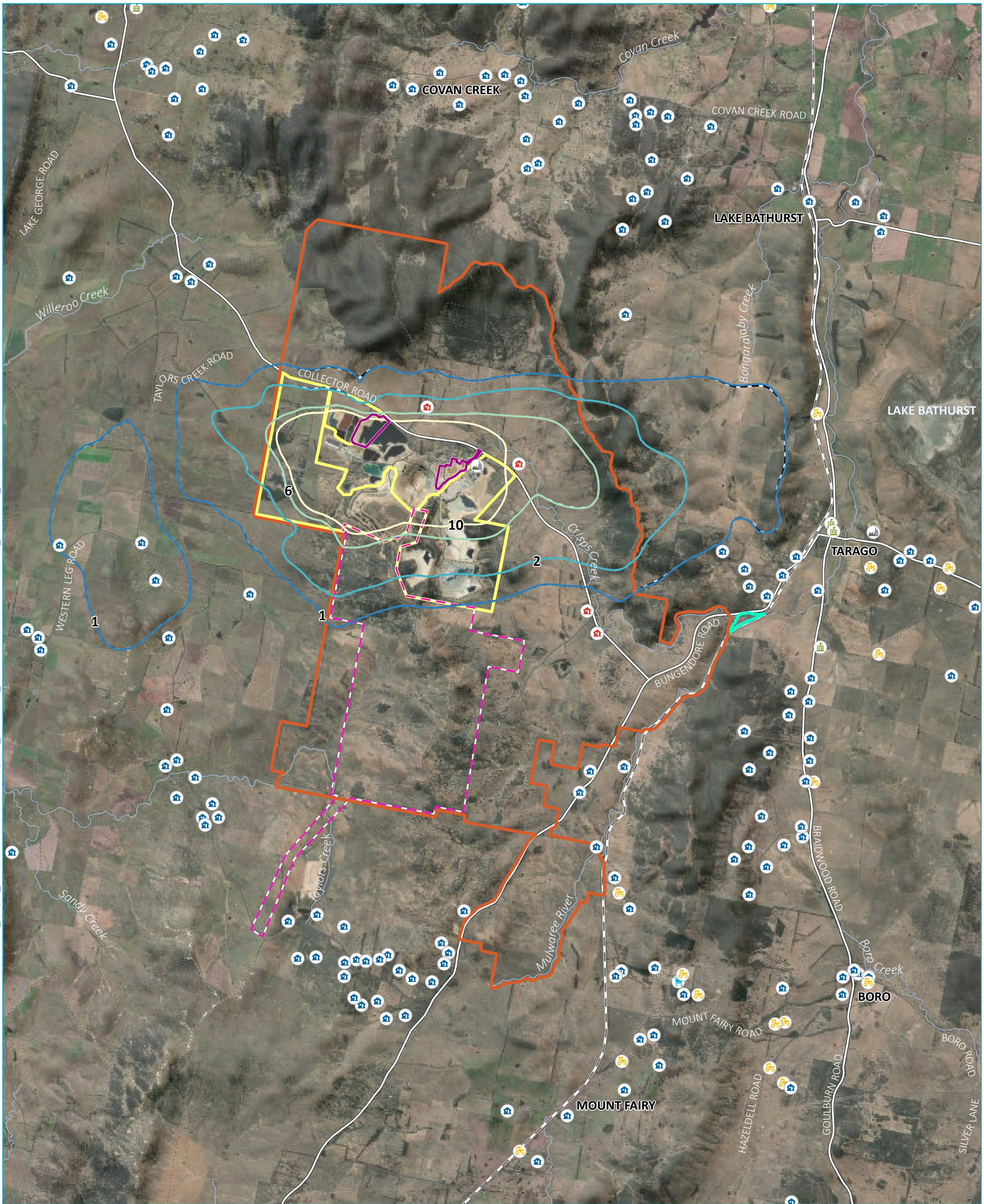
Assessment location type	Highest predicted 1 second nose response by assessment location type and percentile (ou)						
	Approved operations (Bioreactor and MBT)		ARC only		Future operations (Bioreactor MBT and ARC)		Impact Assessment Criteria 99th percentile
	99th percentile	Maximum	99th percentile	Maximum	99th percentile	Maximum	
Residential	1	7	<1	<1	1	7	6
Veolia-owned	8	22	<1	1	8	22	6
Industrial – Woodlawn mine	16	31	<1	3	16	33	6
Agriculture	<1	3	<1	<1	<1	3	6
Commercial	<1	1	<1	<1	<1	1	6
Community	<1	2	<1	<1	<1	2	6
Church	<1	<1	<1	<1	<1	<1	6
School	<1	3	<1	<1	<1	3	6
Preschool	<1	4	<1	<1	<1	4	6
Vineyard	<1	1	<1	<1	<1	1	6

Note: IAC = Applicable impact assessment criteria

All assessment locations are below the odour impact assessment criterion of 6 ou for both approved and future operations. Further, it is noted that across all sensitive (privately-owned) assessment locations, the predicted odour concentrations also comply with a more conservative odour impact assessment criterion of 2 ou.

Relative to approved operations of the Eco Precinct (eg Bioreactor, MBT, leachate treatment etc), the addition of the ARC does not increase the predicted odour (based on the 99th percentile predictions) for future operations.

Figure 8.6 presents contour plots of predicted 99th percentile 1 second nose response odour concentrations for approved operations (solid lines on Figure 8.6) and approved operations plus the ARC (dashed lines on Figure 8.6). The contours directly overlap each other, and therefore it is difficult to discern the approved operations (solid lines) compared to the approved operations plus the ARC (dashed lines) on Figure 8.6. There is negligible difference between the contours for the two presented scenarios.



\\emmsvr1\EMM3\2020\J200931 - Woodlawn Veolia\GIS\02_Maps_EIS\WoodlawnEISTechChapters_20211019_01\WoodlawnEISTechChapters_20221005_06.aprx

Source: EMM (2022); Veolia (2022); DFSI (2017)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

KEY

Development footprint
Woodlawn Eco Precinct
Crisps Creek Intermodal Facility (IMF)
Woodlawn Mine operations area
Woodlawn Wind Farm
Rail line
Major road
Minor road
Vehicular track
Watercourse

Assessment location
Agriculture
Community/school
Commercial
Industrial
Residential
Veolia

Odour concentration- approved
1
2
6
10

Odour concentration- approved plus ARC
1
2
6
10

Predicted 99th percentile 1-second nose response odour concentration – approved only and approved plus project

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.6

EMM
creating opportunities

8.1.4 Management measures

i Construction

Measures have been recommended for the construction of the project and are summarised in Table 8.3. A CEMP will be prepared for the project construction phase which will outline measures to manage dust.

Table 8.3 Air quality and odour management and mitigation measures

Impact/risk	ID	Measure	Timing
Reporting and record keeping	AQO1	Develop appropriate communications to notify the potentially impacted residences of the project (duration, types of works, etc), relevant contact details for environmental complaints reporting.	Pre-construction
Reporting and record keeping	AQO2	A complaints register should be maintained throughout the construction phase which should include any complaints related to dust. Where a dust complaint is received, the details of the response actions to the complaint should be detailed in the register.	Construction
Reporting and record keeping	AQO3	Record any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation in the register.	Construction
Reporting and record keeping	AQO4	Carry out regular site inspections, record inspection results, and make the logbook available for review as requested.	Construction
Dust	AQO5	Provide an adequate water supply on the construction site for effective dust/particulate matter suppression/mitigation.	Construction
Dust	AQO6	Avoid site runoff of water or mud.	Construction
Dust	AQO7	Temporary cessation of non-essential dust generating activities during high winds	Construction
Materials handling	AQO8	Prevention of truck overloading to reduce spillage during loading/unloading and hauling.	Construction
Materials handling	AQO9	Minimise drop heights from loading or handling equipment.	Construction
Soil stripping	AQO10	Soil stripping will be limited to areas required for extraction/construction of foundations etc.	Construction
Soil stripping	AQO11	Only the minimum area necessary will be disturbed.	Construction
Exposed areas	AQO12	Exposed areas will be stabilised as soon as practicable.	Construction
Dust from vehicles on unpaved roads	AQO13	Watering of main material haulage routes as required.	Construction
Dust from vehicles on unpaved roads	AQO14	Routes to be clearly marked and speed limits enforced.	Construction
Dust from vehicles on unpaved roads	AQO15	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Construction
Vehicle fuel combustion emissions	AQO16	Ensure proper maintenance and tuning of all equipment engines.	Construction
Vehicle fuel combustion emissions	AQO17	Ensure vehicles switch off engines when stationary.	Construction

ii Operation

The European Union Industrial Emissions Directive (IED) 2010/75/EU (Integrated Pollution Prevention and Control) *Best Available Techniques Reference Document for Waste Incineration* (Neuwahl et al 2019) documents BAT for the management of environmental impacts, including air pollution, from the waste incineration industry. A detailed review of the mitigation measures proposed for the project has been undertaken as part of the EIS (refer to Appendix L). The reviews concluded that the measures proposed for implementation at the project are aligned with accepted BAT measures for air pollutant emission control wherever practicable to do so.

a Ambient air quality monitoring

To monitor emissions from the project, Veolia will develop an air quality monitoring program, that is likely to include installation and operation of a minimum of three ground level ambient air quality monitoring stations for the following parameters:

- particulate matter (PM_{10} and $PM_{2.5}$);
- NO_X/NO_2;
- VOCs;
- H_2S (for landfill gas odour from Eco Precinct, rather than project); and
- meteorological conditions (wind speed and direction minimum).

The existing meteorological and dust deposition monitoring equipment at the Eco Precinct will continue to form part of the ambient air quality monitoring network.

b Stack emissions monitoring

In accordance with the EfW Policy Statement, the ARC will feature a continuous emissions monitoring system for emissions from the ARC building (ie process air pollution via the stack). The final specifications of the continuous emissions monitoring system will be determined in the accordance with the EfW Policy Statement. In accordance with the requirements of the EfW Policy Statement, as far as practicable to do so, validated emission monitoring data will be made available publicly through an online portal within 24 hours following the end of a weekday and the following weekday after weekends and public holidays. Emission monitoring data will be made available to the EPA in a real time graphical publication as well as a weekly summary of continuous monitoring data and compliance with emissions limits.

A comprehensive air quality management plan, addressing the continuous emissions monitoring system and management procedures in response to recorded concentrations, will be developed following approval of the project and prior to the commencement of construction.

8.1.5 Conclusion

It is acknowledged that air quality emissions from the project, in particular during operation of the ARC, are a key matter of concern by the community and other stakeholders. Dispersion modelling was completed to predict emissions from the project for three scenarios, the reference case-average emissions, reference case – maximum emissions and the regulatory case. For all scenarios, all predicted concentrations and deposition rates are below the applicable impact assessment criterion at all surrounding privately-owned assessment locations. The cumulative impact results presented for the three project scenarios are not significantly different from the results presented for approved operations at the Eco Precinct.

This indicates that:

- the introduction of the project will not significantly change air quality impacts currently associated with the Eco Precinct; and
- relative to ambient background concentrations, air quality impacts associated with the Eco Precinct are minor at surrounding sensitive assessment locations.

All assessment locations are below the odour impact assessment criterion for both existing and future operations. Relative to existing operations of the Eco Precinct, the addition of the ARC does not increase the predicted odour for future operations.

Veolia will implement a range of air pollution emission mitigation technologies and practices to minimise air pollutant emissions from the project. A review of proposed mitigation measures for the project relative to BAT was undertaken, with the review highlighting that the project is well aligned with BAT for the control of air pollutant emissions.

Veolia will implement a comprehensive continuous environmental monitoring system (CEMS) in accordance with the requirements of the EfW Policy Statement and will establish an ambient air quality monitoring program surrounding the project.

8.2 Human health

8.2.1 Introduction

It is recognised that a key concern from the community is the potential for the project to impact on human health. To address this issue a human health risk assessment (HHRA) was prepared to quantitively assess human health risks resulting from the project. The HHRA uses data from the AQIA to determine whether the chemical constituents in the emissions from the project could impact human health. The full HHRA is provided in Appendix P and is summarised in this section.

i Assessment guidelines and requirements

The HHRA was prepared to address the SEARs, and the specific requirements of government agencies. The relevant SEARs and how they are addressed, are summarised in Appendix A.

The SEARs also required that the HHRA consider cumulative human health risk impacts associated with the existing Eco Precinct operations and surrounding developments, including the Jerrara Power Energy from Waste Facility proposal. It is noted that the application for the Jerrara project was withdrawn on 28 September 2021; therefore it has not been considered.

The HHRA was undertaken in accordance with the following guidelines:

- enHealth, 2012. Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards (enHealth 2012a), and associated Australian Exposure Factor Guidance (enHealth 2012b); and
- guidance and guidelines available from the National Environment Protection Council in relation to ambient air quality (NEPC 2016 and NEPC 2021) and contaminated land (NEPC 1999 amended 2013a).

Where relevant, the HHRA has also considered impacts to community health as outlined in the following guidance documents:

- enHealth, 2017. Health Impact Assessment Guidelines (enHealth 2017).
- Harris, P., Harris-Roxas, B., Harris, E. & Kemp, L., Health Impact Assessment: A Practical Guide, Centre for Health Equity Training, Research and Evaluation (CHETRE), 2007. Part of the UNSW Research Centre for Primary Health Care and Equity. University of New South Wales (Harris 2007).

In general, the HHRA focused on impacts to community health for populations located off-site. The HHRA has not addressed risks to workers involved in construction or operation of the project, however it has considered potential impacts to workers at the adjacent Woodlawn Mine. Workers involved in construction and operation of the ARC project would be managed under the *Work Health and Safety Act 2011* and *Work Health and Safety Regulation 2017* and all other relevant codes of practice as detailed by Work Safe NSW and Safe Work Australia.

ii Summary of assessment methods

The HHRA relied on the air quality modelling presented in Section 8.1 and follows the principles outlined in the enHealth document *Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards* (enHealth 2012a). Figure 8.7 provides an overview of the HHRA process. This approach requires assessment of:

- how people may be exposed to the emissions to air over the short-term (acute) and the long-term (chronic);
- the hazards posed by (or toxicity of) the chemicals present in the emissions (ie hazard or toxicity assessment); and
- calculation of potential risks to health, or risk characterisation.

The HHRA considered all the likely methods that an individual could be exposed to emissions from the project (exposure pathways). These included:

- inhalation;
- dermal exposure, and incidental ingestion of indoor dust, soil and water (both recreational water bodies and tank water used in homes);
- eating or drinking local produce including milk, fruit, eggs, vegetables, meat etc; and
- drinking water collected from roofs in rainwater tanks.

The method adopted a conservative approach in relation to the length of exposure to pollutants. When assessing chronic inhalation exposures, the following has been assumed:

- At the location of maximum concentrations in air in commercial industrial areas and on the site boundary – it is assumed that workers spend 8 hours per day, every workday each year for 30 years.
- At the location of maximum concentrations in air in rural residential and other residential areas – it is assumed that residents spend 24 hours per day, every day of the year (365 days) for 70 years.

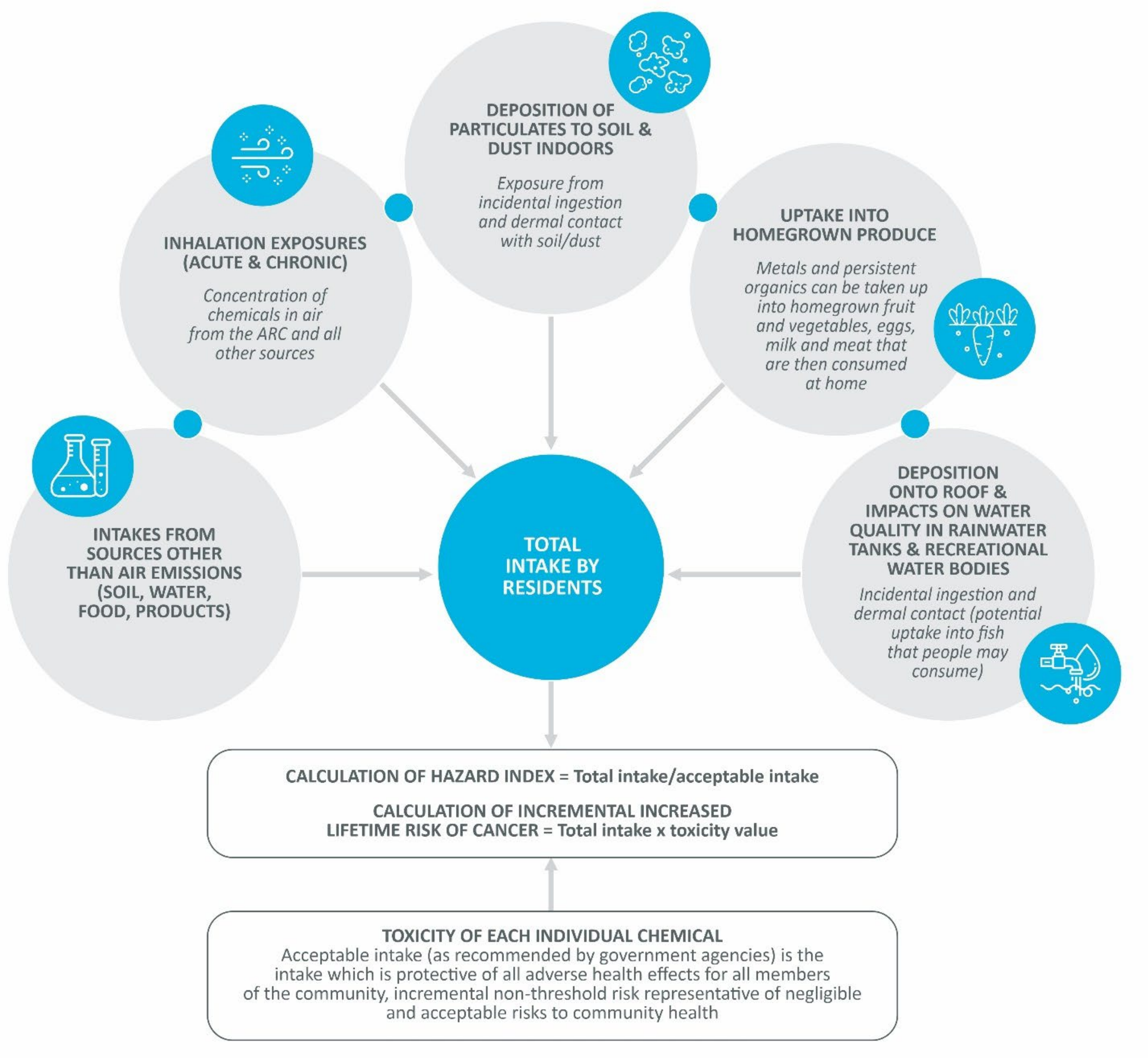


Figure 8.7 Overview of the HHRA process

These exposures were then assessed using worst-case assumptions that include:

- the concentration in soil and indoor dust is a cumulative concentration following emissions and continual deposition for 70 years with no cleaning indoors, no addition of fertiliser or other soil to gardens, no washing of produce prior to consumption; and
- rainwater tanks are used for potable water and do not include a first-flush device.

The HHRA has also considered impacts on groundwater quality, recreational water quality in lake George and Lake Bathurst and the sale of crops and produce into the market (including impacts on organic produce).

8.2.2 Existing environment

This section describes the existing environment relevant to potential human health impacts.

i Human health receptors

A range of locations in the surrounding region which host land uses with the potential to be impacted by human health impacts from the project were identified. Key features of the community surrounding the project include:

- the industrial uses at the Woodlawn Mine which is within the Eco Precinct;
- rural properties adjacent to and surrounding the Eco Precinct;
- township of Tarago located approximately 6 km to the east;
- the village of Lake Bathurst approximately 9km from the project;
- townships of Collector located approximately 20 km to the north west and Bungendore located approximately 24.5 km to the south;
- recreational areas of Lake Bathurst located 8.7 km to the north east and Lake George located 7.5 km to the west; and
- rural uses in the area surrounding the Eco Precinct include beef, lambs, sheep, horses, truffles, alpacas and crops including oats, barley and canola.

The assessment location for the HHRA are the same as the AQIA, as shown in Figure 8.1, and include rural residential homes, towns of Tarago, Collector and Bungendore and recreational waterbodies of Lake Bathurst and Lake George.

A summary of nearby receptors is presented in Table 8.4.

Table 8.4 Summary of nearby receptors

Receptor type/category	Number of properties	Closest distance to ARC stack (km)
Church	1	10.3
Commercial	1	10.4
Community	1	7.5
Industrial (includes Woodlawn Mine)	2	0.4
Preschool	1	7.1
Residential	181	4.0
School	1	7.0
Veolia	4	1.2
Vineyard	1	8.4

ii Demographics

The community in the area surrounding the project is generally similar to the larger population in Goulburn LGA and NSW with the exception of the following:

- The populations of the state suburbs surrounding the Project site are quite small which would result in more variable statistics than larger population groupings in LGAs.
- The population in the suburbs of Tarago, Lake Bathurst and Currawang has a lower rate of unemployment and is considered least socioeconomically disadvantaged. These aspects suggest the population may have some decreased level of vulnerability to project related impacts.
- The population of Lake Bathurst has a lower proportion of young children and a higher proportion of people aged 65 years and older.
- The LGAs that encompass these smaller populations indicate a higher proportion of people aged 65 years and older in Goulburn Mulwaree LGA, with the population in Queanbeyan having a lower rate of unemployment and are considered least socioeconomically disadvantaged.

Overall, the demographic data does not indicate the communities surrounding the project would have increased vulnerability to human health impacts.

iii Community health

The key indicators of health for the population in areas surrounding the site indicate the following, when compared with the data for NSW:

- The population in Southern NSW Local Health District has a lower proportion of the population (adults and children) who consume the recommended intake of vegetables, the adults have a higher long-term consumption of alcohol, higher rate of smoking and a higher proportion of the population that is overweight. Both adults and children have higher rates of adequate physical exercise.
- The population, including the LGA of Goulburn Mulwaree, has a higher rate of mortality (all causes). The population of the Southern NSW Local Health District has a higher rate of mortality from respiratory disease, and higher rates of high blood pressure and asthma in adults. It is noted that while the rate of asthma in adults is significantly higher than NSW, the rate of asthma in children is not different to the rate for NSW as a whole.

The above indicates that, based on existing health related behaviours and health statistics, the surrounding community may have some increased vulnerability to project related impacts. Further discussion of health data can be found in Section 8.14 and in Appendix CC (Social Impact Assessment).

8.2.3 Potential impacts

The potential impacts of the project on human health considered here relate primarily to the generation of emissions to air during the operation of the ARC. The following sections describe the potential for impacts to arise during operation of the ARC. The HHRA assessed the potential impacts from two scenarios taken from the AQIA (Appendix O) and reported in Section 8.1:

- Scenario 2 Reference case – maximum emissions, which is a highly conservative assessment of the ARC project, taking the highest concentrations and flows from the reference facility and applying them to every operational hour of the year at Woodlawn.

- Scenario 3 Regulatory case – which takes the maximum emissions permitted under the NSW EfW Policy and applies them every hour of the year.

Both of these scenarios provide for significantly great volumes of pollutant emissions than Scenario 1 Reference case (expected emissions). Therefore, they were modelled in the HHRA to provide the most conservative assessment of potential impacts.

i Exposure assessment – conceptual site model

As summarised earlier, a conceptual site model was prepared to identify how a community member may come into contact with pollutants released in air emissions from the proposed ERF. For some of the emissions from the project, inhalation is considered the only route of exposure. This is due to the substance's chemical properties, which make the other pathways inconsequential.

Other pollutants may be inhaled, but also may be deposited on the ground/surfaces with the deposition of dust. These pollutants can then be ingested either directly through accidental consumption of soil or indirectly through food/produce grown or raised in the soil (fruit, vegetables, eggs, meat or milk), or deposited onto a roof where it may be washed into and affect water quality in rainwater tanks.

Dust may also deposit to larger water bodies used for recreational purposes. Skin contact with the soil and water in rainwater tanks or recreational water is also possible. Therefore, it is important with these emissions that all these exposure pathways are considered.

Table 8.5 lists the substances evaluated in the assessment of emissions to air from the project and the exposure pathways of potential concern. Figure 8.8 provides a diagrammatical representation of the community exposures to emissions from the project (conceptual site model).

Table 8.5 Substances and routes of exposure

Exposure route	Substance	
Inhalation only – these are gases.	• Nitrogen dioxide	• Carbon monoxide
	• Sulfur dioxide	• Ammonia
	• Hydrogen chloride	• Volatile organic compounds (VOCs) as benzene
	• Hydrogen fluoride	
Inhalation relevant for particulates based on particle size (it is noted that other exposure pathways have also been assessed for the individual chemical substances bound to these particles).	• Particulate matter (PM_{10} and $PM_{2.5}$)	
Inhalation of these pollutants adhered to fine particulates. Ingestion and dermal contact with these pollutants deposited to soil, deposited to a roof where they wash into and impact on water quality in rainwater tanks, or deposited to recreational areas such as Lake George and Lake Bathurst. It is recognised that the surrounding rural and residential areas include rainwater tanks that are used for drinking water/potable water.	• Antimony	• Manganese
	• Arsenic	• Mercury
	• Beryllium	• Nickel
	• Cadmium	• Thallium
	• Chromium	• Vanadium
	• Copper	• Zinc
	• Cobalt	• Dioxins/furans

Table 8.5 Substances and routes of exposure

Exposure route	Substance	
Ingestion of produce grown in soil potentially impacted by these pollutants. For this assessment, the surrounding rural residential areas may include homegrown fruit and vegetables, eggs, home consumed beef and lamb as well as crops such as oats, barley and canola as well as truffles and grapes. Metals, dioxins/furans, dioxin-like PCBs and PAHs can be taken up/bioaccumulated into plants and animal products that may be consumed.	• Lead • Polycyclic aromatic hydrocarbons (PAHs)	• Dioxin-like polychlorinated biphenyls (PCBs)

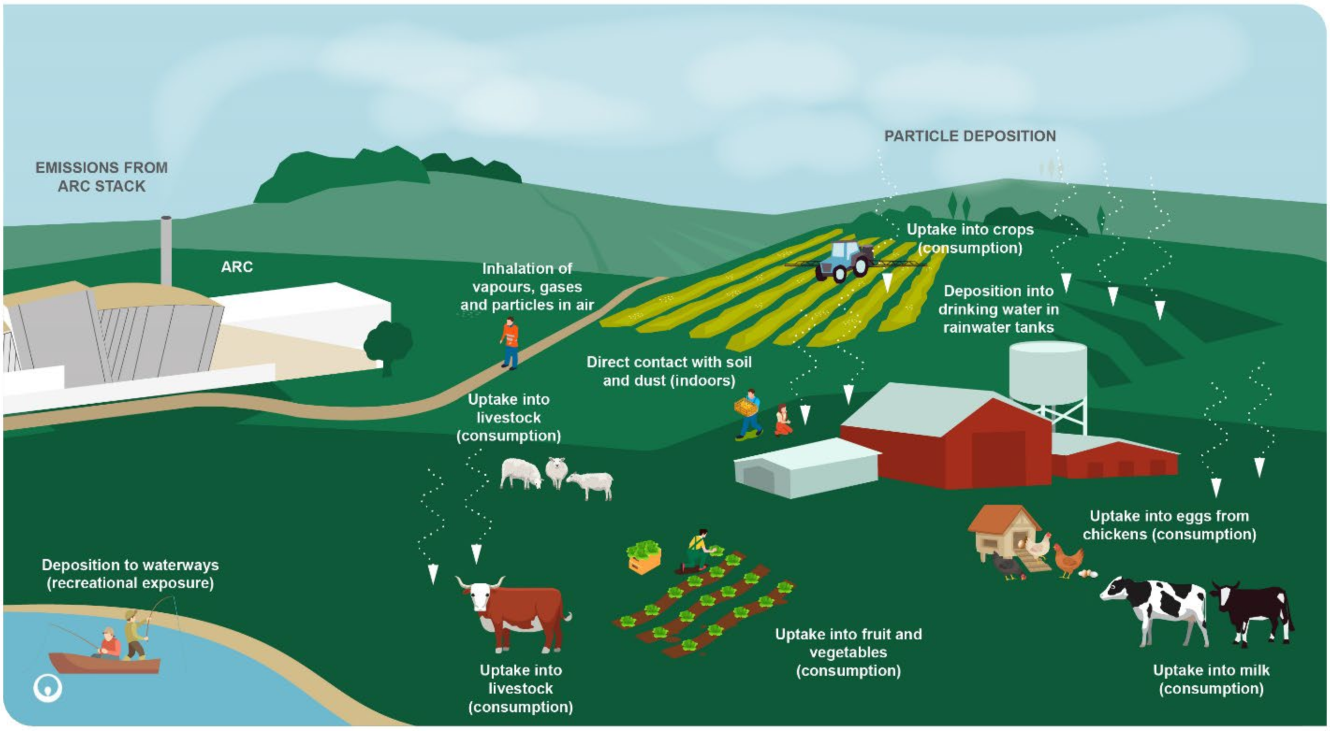


Figure 8.8 Human health risk assessment conceptual site model

For each scenario the assessment addressed the following:

- inhalation exposures for particulates, NOx, SOx, CO, and all other pollutants;
- multi pathway exposure;
- residential drinking water exposure; and
- recreational exposure to water.

A summary of the findings is set out in the following sections whilst the full HHRA is included at Appendix P.

ii Inhalation exposures

A summary of the potential health impacts of the predicted inhalation exposures is presented in Table 8.6 below.

Table 8.6 Summary of inhalation exposure assessment

Substance	Project emissions	Human health impact
Particulates ($PM_{2.5}$)	The AQIA (Appendix O) found that the worst-case $PM_{2.5}$ derived from the ARC would make a very small contribution to existing concentrations and only makes up a small fraction of the *National Environment Protection (Ambient Air Quality) Measure* (NEPM) (Department of the Environment 2021) (the NEPM guideline). Emissions from the project are unlikely to change the number of exceedances of the NEPM guideline, many of which are due to elevated background levels of $PM_{2.5}$ due to domestic wood burning, controlled burns and bushfires. Across the two scenarios the maximum predicted 24 hour average concentrations of $PM_{2.5}$ at receptors is 23.2 $\mu g/m^3$ which is less than the NEPM guideline of 25 $\mu g/m^3$. Annual average $PM_{2.5}$ at receptors (7.2 $\mu g/m^3$) is also predicted to be below the NEPM guideline of 8 $\mu g/m^3$. The incremental individual risk associated with changes in $PM_{2.5}$ from the facility was also calculated. Based on an annual average increase of $PM_{2.5}$ of 0.002 $\mu g/m^3$ (Scenario 2) and 0.04 $\mu g/m^3$ (Scenario 3) the risk levels were found to be negligible as per guidance from enHealth and NEPC (enHealth 2012a; NEPC 2011).	Based on the predicted project emissions and incremental risk calculated, changes in $PM_{2.5}$ from the project would have only a negligible impact on the health of the off-site community.
Sulfur dioxide	There is no significant change in the maximum concentration (maximum anywhere) of SO_2 as a result of the operation of the ARC for Scenario 2 or 3. It is noted that the maximum 1 hour average SO_2 concentration is below the 2016 guideline, but exceeds the 2021 guideline, regardless of the operation of the ARC. All predicted concentrations in industrial areas, or in the community, relevant to the Scenarios 2 or 3, are below the NEPM criteria that are protective of short-term exposures (1 hour average) and chronic exposures (annual average).	There are no risk issues of concern for community health in relation to SO_2 emissions from the ARC Project
Nitrogen dioxide	There is no change in the maximum concentration (maximum anywhere off-site) of NO_2 as a result of the operation of the ARC for Scenarios 2 or 3. It is noted that the maximum 1 hour average NO_2 concentration is below the 2016 guideline, but exceeds the 2021 guideline, regardless of the operation of the ARC. All predicted concentrations in industrial areas, or in the community, relevant to Scenarios 2 or 3, are below the NEPM criteria that are protective of short-term exposures (1 hour average) and chronic exposures (annual average).	There are no risks to community health in relation to NO_2 emissions from the project.
Carbon monoxide	Emissions of CO from the ARC make no change to the existing air quality in the community for both Scenario 2 and Scenario 3. All concentrations of CO are well below the relevant health protective criteria.	There are no risks to community health in relation to CO emissions from the ARC Project.
All other pollutants	For all other pollutants, inhalation exposures have been considered for both short-term/acute exposures as well as chronic exposures. All maximum predicted concentrations of chemicals in air are below the health-based criteria protective of acute effects. All calculated incremental lifetime risks associated with exposure to benzene and PAHs are well below the criteria representative of negligible risk. The calculated hazard index for all chemicals are less than the criteria indicating negligible/acceptable exposures.	There are no acute or chronic risk issues of concern in relation to inhalation exposures to emissions from the project.

iii Multiple pathway exposures

Where pollutants may be bound to particulates (as TSP), are persistent in the environment and have the potential to bioaccumulate in plants or animals, it is relevant to also assess potential exposures that may occur as a result of particulates depositing to the environment where a range of other exposures may then occur. These include:

- Deposition to water:
  - rainwater tanks (ingestion and dermal contact with water); and
  - larger water bodies such as Lake Bathurst and Lake George (ingestion and dermal contact with water as well as ingestion of fish).
- Deposition to soil:
  - incidental ingestion and dermal contact with soil;
  - ingestion of homegrown fruit and vegetables;
  - ingestion of eggs; and
  - ingestion of other produce at a rural residential property (eg milk, lamb, beef etc) and the sale of such produce.

It is noted that assessment of potential risks related to exposure to water in rainwater tanks and recreational water is presented separately in Sections 8.2.3iv and 8.2.3v. In addition, assessment of risks relevant to the growing of crops such as wheat, barley and canola are presented separately in Section 8.2.3vi.

The multi pathway assessment included a broad range of combined pathways including one scenario with exposure by inhalation, soil ingestion, soil dermal contact, as well as consumption of home-produced fruit, vegetables, milk, beef and lamb for a resident who was at home 365 days per year and was subject to these exposure pathways daily for 70 years. Even with this large number of exposure pathways and long exposure time, under both scenarios, a resident would remain below the target risk levels representative of negligible/acceptable risk. On the basis of the assessment undertaken there are no chronic risk issues of concern in relation to multiple pathway exposures that may be relevant to the off-site community.

iv Residential drinking water exposures

The HHRA assessed potential impacts on the quality of water in rainwater tanks at residential and rural properties surrounding the project. The deposition of chemicals attached to particulates to a roof, and accumulation in rainwater was estimated for the maximum impacted receptor location. Predicted concentrations in in rainwater tanks have then been compared with drinking water guidelines, which are protective of all exposures relevant to potable water use including ingestion, dermal contact, bathing and irrigation of produce that may be consumed. These guidelines are also protective of the health of pets who may consume water from rainwater tanks.

The predicted water concentrations in rainwater tanks are all well below drinking water guidelines. The calculations also demonstrate that the contribution of ARC project emissions to water quality in rainwater tanks would not cause any measurable change to the existing water quality in rainwater tanks (ie concentrations are so small as to not be measurable). There are no risk issues of concern in relation to potential exposures of persistent and bio accumulative chemicals that may be present in rainwater tanks surrounding the site as a result of the project. Full details can be found in Appendix P.

v Recreational exposures to water

In the areas surrounding the project, the key recreational water bodies are Lake Bathurst and Lake George. These water bodies are large and located further away from the project than the sensitive receptors evaluated in the assessment of residential drinking water exposures. Calculations presented in Appendix P for the impact of the project on water quality in rainwater tanks close to the project are more conservative than any calculations that can be undertaken for these lakes, as the residential receptors are closer to the source and volume of water into which deposition accumulates is smaller for rainwater tanks. This means that at Lake Bathurst and Lake George, the deposition rate will be lower and what is deposited would be mixed in a greater volume of water resulting in even lower concentrations than those estimated for rainwater tanks. In addition, the water quality guidelines for recreational exposures are 10 times higher than for drinking water consistent with guidance provided by NHMRC (NHMRC 2008) and the WHO (WHO 2006). Given that the assessment of risks related to rainwater tanks determined that the ARC impacts are negligible, the same conclusions can be inferred for recreational use of Lake Bathurst and Lake George.

vi Impacts relevant to produce

a Crops

Concerns have been raised regarding the potential for pollutants to impact on crops produced in the region, and so this issue has also been investigated. Chemicals may be emitted from the proposed facility attached to particles and once emitted to the atmosphere may fall out of the air and deposit onto the surface of plants, buildings, roads and soil. If attached chemicals are persistent and the particles mix into the soil or are present on the leaves of a plant, they may be taken up by plants into the parts people (or livestock) may consume – ie accumulation.

This pathway was assessed for both scenarios for relevant chemicals including metals and persistent organics like dioxin-like compounds and PAHs.

Where rural properties in the surrounding areas are used for the growing of crops such as wheat, barley, canola, truffles or grapes, these crops may be sold to the market for use in a range of products.

Hence it is not appropriate to assess exposures associated with grain production and consumption for the rural properties where the grain is grown. However, it is relevant to evaluate if the grain produced would remain in compliance with the maximum limits (MLs) in the Food Standards Code (FSANZ 2017). For PAHs, the EU (which is referenced by FSANZ in the absence of an Australian value) provides a maximum limit for cereal products. There are no other regulatory limits that can be referenced. Full details of the assessment are included in Appendix P.

The results indicated that the maximum predicted concentrations for arsenic, cadmium, lead and PAHs relevant to both Scenario 2 and Scenario 3 are well below the MLs relevant to these pollutants, and maximum predicted concentrations for other pollutants relevant to both Scenario 2 and Scenario 3 are well below the range of mean concentrations reported in existing/typical food products.

On this basis, emissions from the ARC (+ existing sources) are considered to be negligible in terms of their contribution to existing background levels in cereal products consumed in the market. The predicted concentrations in cereal crops, as a result of emissions from the ARC (+ existing sources), would not be detectable or discernible in any analysis. In addition, deposition of particles from emissions from the project would not result in any measurable change in soil quality in the area. Hence the project would not change existing conditions or result in impacts on crops grown on farms with organic farming status.

b Other produce

The assessment of potential multi-pathway exposures presented above and in Section 4.6 of Appendix P included an assessment of risks to human health where metals and persistent organic compounds may accumulate into eggs, milk and meat. For some of these products, maximum limits (MLs) are detailed in the Food Standards Code for Australia (FSANZ 2017). Where these produce are sold to the market, compliance with these maximum limits is a legal requirement. It is relevant to ensure that the maximum calculated concentrations estimated using deposition of particles from the emissions of the facility are below the MLs relevant to these products.

This assessment is detailed in Appendix P at Section 4.9.2. The conclusion from the assessment was that the emissions from the ARC + existing emissions (for Scenario 2 – reference case maximum emissions and Scenario 3 – NSW EfW regulatory emissions) would not result in any measurable impact on produce grown in the local area. Concentrations of metals derived from these emissions are predicted to result in produce levels below the regulatory MLs, and concentrations of dioxin-like compounds are predicted to result in produce levels below EU regulatory levels. Hence the project would not impact on the quality of produce sold from farms in the area.

8.2.4 Other issues

i PFAS

Another group of chemicals that has been of concern to communities is the per- and polyfluoroalkyl substances (PFAS) which have been discussed in the media for sites where firefighting foams may have been used (Defence bases and airports, in particular).

PFAS constitute a family of man-made fluorine-containing chemicals. They do not occur naturally in the environment. They have unique properties that make materials stain- and water-resistant. These unique properties also make them persistent in the environment and highly mobile in soil and water (ie they readily leach into groundwater). These chemicals are highly water soluble (and often present as ions in solution) and most of the commonly present substances are not volatile (HEPA 2020).

These chemicals have been used in a wide range of products including:

- firefighting foams;
- packaging materials for food;
- waterproofing or stain proofing agents (eg Scotchguard);
- non-stick products (eg Teflon);
- polishes;
- waxes;
- paints;
- cleaning products; and
- surfactants used in chrome plating or electronics manufacture (HEPA 2020).

It is possible that low levels may be present in the proposed residual waste fuel due to the low levels of PFAS in various consumer products and packaging (especially fast-food packaging) that would be present in domestic MSW.

Concerns regarding this group of chemicals were raised internationally around the year 2000. A number of chemicals in this group have since been included on the list of chemicals regulated by the Stockholm Convention – an international treaty to which Australia is a party that requires uses of listed chemicals (long lived/persistent ones) to be reduced or eliminated.

Since 2000 many uses of these chemicals have been phased out. Such reductions are expected to continue given the listing of these chemicals on the Stockholm Convention. As a result, the presence of these chemicals in current and future waste fuel would be expected to continue to decrease and to already be much lower than the levels currently discussed in the scientific literature relating to waste materials.

Methods for the analysis of these chemicals in air are not routinely available (HEPA 2020). There is no requirement for analysis of these chemicals in emissions from similar plants in Europe due to the difficulty in undertaking such analysis and the expected low levels. As a result, there are no monitoring data available, and it is not currently possible to undertake a detailed quantitative assessment. In addition, the NSW EPA Policy and EU BREF emission limits do not include consideration of PFAS emissions.

It is noted, however, that the ARC has the capacity to manage small amounts of such chemicals appropriately if they were to be present in the fuel. The flue gas treatment technology proposed can address the presence of these chemicals using the following:

- Combustion chamber – PFAS are usually present in materials that could be in the residual waste as mixtures. Within those mixtures some PFAS chemicals are readily degradable at temperatures easily reached in the chamber. Some of the chemicals do require higher temperatures to breakdown. It is noted that much of the chamber will have temperatures in excess of 850oC and these temperatures along with sufficient oxygen will allow for effective combustion (at least 90%) of these chemicals.

- Acid gas treatment (injection of hydrated lime) – the flue gas treatment technology proposed includes a process for removing acid gases from the air – this treatment process will also assist in the removal of the breakdown products from the destruction of PFAS.

- Activated carbon treatment – activated carbon is added to the waste gases to remove metals and a range of other chemicals – this technology will also assist in removing PFAS.

- Baghouse – chemicals attached to particles (including activated carbon particles) are captured within the baghouse – this will include any remaining PFAS.

Risks due to the presence of the expected very low to negligible levels of these chemicals within the fuel to be combusted at this facility are expected to be low to negligible.

ii Community studies

The assessment presented in this report provides a quantitative evaluation of risks to community health following enHealth guidelines. These guidelines are consistent with the approaches to assessing health risks for such facilities from international jurisdictions.

The scientific literature also provides a number of other studies, specifically epidemiological studies that have focused on emissions to air from waste to energy facilities and potential health effects within communities surrounding the particular facility. Many of the published studies relate to older facilities that do not comply with more recent EU directives (IED emission limits and BREF limits). Only studies that relate to more recent facilities complying with these emissions standards and guidance (or equivalent such as the NSW EfW Policy) are relevant for any comparison with the proposed ARC. Many of the energy from waste facilities evaluated in the epidemiological studies are facilities combusting domestic waste (along with other non-putrescible waste). This is consistent with the proposed ARC Project.

Reports or studies that have reviewed published information and studies on EfW facilities designed to meet EU IED or equivalent emissions limits, have not identified evidence of adverse impacts on community health. Most studies also acknowledge that the number of available studies is limited in relation to these newer facilities, however, in the available studies relevant to modern facilities that meet these standards, no adverse health effects have been identified.

These studies include:

- Literature review undertaken for EPA Victoria (EPA Victoria 2018) and by other Australian researchers (Cole-Hunter et al. 2020; Morgan et al. 2019; Tait et al. 2020) as well as the review completed by the NSW Chief Scientist (NSW Chief Scientist & Engineer 2020).

- Review of research into health effects of EfW facilities focusing on facilities operating in the UK (Broomfield 2012; Marner, Richardson & Laxen 2020), with a series of more recent epidemiological studies (Freni-Sterrantino et al. 2019; Ghosh et al. 2019; Parkes et al. 2019) specifically addressing foetal growth, stillbirth, congenital abnormalities, infant mortality and sex ratio and other birth outcomes finding no evidence of adverse effects in the community. These studies also indicate that the results should be generalisable to other facilities operating to similar standards.

It should be noted that studies related to older facilities, where emissions did not or do not meet the EU IED or equivalent emission limits, have shown measurable impacts and links with adverse health effects (Tait et al. 2020). Further, the former operation of these older waste incinerators has resulted in the accumulation of dioxin-like compounds in soil and produce (specifically eggs and vegetables) in areas surrounding the facilities (for example a facility operating in France from 1974 to 2002 and a facility operating from 1958 to 1982 in Lausanne Switzerland (Petrlik et al. 2022; Pirard et al. 2004)). Investigations conducted in the 1990s, in relation to these older facilities, identified the need to reduce emissions from waste incineration facilities and ongoing technology reviews. These changes have resulted in significant measured improvements in emissions. For example, emissions of dioxin-like compounds from waste incineration in France and Japan have reduced more than 99% from the 1990's to around 2010 (Coudon et al. 2019; Li et al. 2019; Nzihou et al. 2012). This means impacts on air quality from these types of facilities are significantly smaller now than they were previously.

Studies related to these older facilities are not relevant to the assessment of potential health impacts from new energy from waste facilities that comply with the more stringent emissions limits from the EU IED and BREF limits or the NSW Policy (NSW EPA 2021).

There are few studies available that measure concentrations of pollutants in soil and produce in rural areas surrounding operational modern energy from waste facilities (that meet IED emission limits or equivalent).

The study by van Dijk et al (van Dijk, van Doorn & van Alfen 2015) involved testing for levels of cadmium, mercury and PAHs in crops (spinach and kale) and dioxin-like compounds (ie dioxins, furans and dioxin-like PCBs) in milk from dairy farms and fluoride in pasture grass around three waste incinerators (combusting municipal solid waste) operating in the Netherlands between 2004 and 2013. The facilities were operating using best available technology applicable at the time of operation. The study showed that emissions from these facilities did not affect the quality of crops and milk in the surrounding areas. Concentrations reported were similar to background levels and did not exceed maximum allowable standards applicable to food products in the Netherlands.

Monitoring of dioxins and furans has also been undertaken in areas surrounding other EfW facilities in Europe (CEWEP 2022) where the following is noted in relation to soil and produce:

- Dioxins and furans were measured in vegetation surrounding an Austrian EfW facility – no significant difference was seen between areas close to the facility and distant.

- Dioxins and furans were measured in blood of people living near and distant from an EfW facility in Turin over a period of 3 years – there was no increase in dioxin levels in blood (ie no evidence of bioaccumulation) and no difference in levels between those close to the facility and those distant from the facility (background).

- Dioxins and furans were measured in cow milk in areas surrounding a Dutch EfW facility between 2009 and 2020 – levels in milk near the plant were no different from background.

- Dioxins and furans were measured in soil samples collected in the area surrounding an EfW facility in Mallorca (Spain) from 1997 to 2020 – the levels reported were variable (with no clear trend of accumulation), but all samples were well below the maximum limit value relevant for soil.

Sampling of dioxins and furans was also undertaken in the area of Harlingen (Netherlands). Levels in grass and eggs were reported to be higher within 2 km of a waste incinerator (noting the area also includes a range of other industries) and some concentrations in eggs exceeded the EU guidelines (Arkenbout 2014; Arkenbout & Esbensen 2017). The facility is an industrial waste incinerator (not a municipal waste incinerator) that was commissioned in2011 and has a low emissions limit for dioxins and furans. However, the facility has had a number of reported operational issues that resulted in elevated dioxin and furan emissions at times (including levels that exceeded their emissions limit). These elevated emissions are reflected in the egg data reported for 2014/2015 (Arkenbout & Esbensen 2017), however it should be noted that more than one source of dioxin-like compounds was identified for this area (ie there were other facilities emitting these chemicals, not just the waste incinerator) (Arkenbout 2014). Another study also reported elevated levels of dioxins and furans in chicken eggs in other areas in Europe. These findings were found to be related to keeping chickens in industrial areas or areas affected by backyard burning of waste (Hoogenboom et al. 2016).

Consistent with the approach outlined by the NSW Chief Scientist (NSW Chief Scientist & Engineer 2020), the potential for accumulation of persistent and bioaccumulative chemicals into produce, including chicken eggs, meat, milk and other produce has been evaluated for this facility using robust risk assessment methods. This is presented in this assessment for the ARC and is relevant to the proposed operation of the EfW facility.

8.2.5 Management measures

The primary actions required to manage the project's impacts to human health are the measures to avoid, minimise and monitor emissions to air from the operation of the ARC that are outlined in Section 8.1.4. No additional measures would be required to manage human health impacts of the project.

8.2.6 Cumulative impacts

The key impacts assessed in the HHRA relate to emissions to air from the ARC which are described and assessed in Section 8.1. The air quality modelling presented in the AQIA (Appendix O) and relied on for the HHRA includes predictions relevant to emissions from the project alone, as well as the project plus all other emission sources in the region. Therefore the impact predictions of the HHRA incorporated data relevant to the project as well as cumulative emissions from all sources relevant to the surrounding area.

8.3 Greenhouse gas and climate change

8.3.1 Introduction

The GHG impact assessment is provided in Appendix Q. The GHG impact assessment was prepared with reference to relevant guidelines and policies, as outlined in Chapter 1 of the GHG impact assessment.

The assessment provides estimates of 'Scope 1', 'Scope 2' and 'Scope 3' emissions for anticipated peak year at the Eco Precinct, with and without the installation of the project, relative to current operational emissions. Scope 1 emissions address the direct emissions that occur within the boundary of an organisation. Indirect emissions are defined as Scope 2 and relate to emissions generated from purchased electricity, whilst Scope 3 include all other upstream and downstream activities.

The GHG impact assessment addresses the SEARs, which specifically request that an assessment of the project's GHG emissions (reflecting the Government's goal of net zero emissions by 2050) are undertaken, including an assessment of cumulative impacts with existing site operations.

As well as the GHG impact assessment, a Life Cycle Analysis (LCA) has been completed in accordance with the Australian Renewable Energy Agency (ARENA) guidelines, as required by the SEARs. The LCA is provided in Appendix R.

i Assessment guidelines and requirements

The National Greenhouse and Energy Reporting (NGER) scheme, established by the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), is a single national framework for reporting information about greenhouse gas emissions, energy production and energy consumption.

Veolia currently reports annual GHG emissions from the Bioreactor and the MBT under the NGER scheme, and the GHG assessment undertaken for this EIS utilised those reporting techniques.

ii Summary of assessment methods

For the purpose of this GHG assessment, the operations relating to the Eco Precinct were taken to include the transfer of waste by rail from the terminals at Banksmeadow and Clyde to the IMF, the subsequent transfer of the waste by road to the Eco Precinct, the transfer of local waste to the Eco Precinct, and on-site operations at the Eco Precinct.

The following activities were not included in the assessment:

- electricity consumption for waste sorting at the Banksmeadow and Clyde terminals;
- diesel consumption for waste sorting at the Banksmeadow and Clyde terminals; and
- process water consumption for waste sorting at the Banksmeadow and Clyde terminals.

Energy consumption for the construction phase was identified as being lower than the anticipated peak yearly GHG emissions and conservatively will account for any potential construction related emissions. Construction emissions were therefore not considered further in the assessment.

The assessment was undertaken to demonstrate the comparison between three potential scenarios:

- Baseline – current operations.
- Scenario 1 – Future operations at approved landfill limits (1.13 Mtpa) with no ARC.
- Scenario 2 – Future operations with ARC.

Table 8.7 below provides a breakdown of the scenario assumptions used for the assessment.

Table 8.7 Scenario assumptions

Parameter	Baseline (current operation, 2020)	Scenario 1 (future approved operations, no ARC)	Scenario 2 (future operation, with ARC)
Inbound waste to Eco Precinct			
From Sydney to Eco Precinct from Sydney (t/year)	813,755	1,180,000	1,180,000
From local area to Eco Precinct (t/year)	130,000	130,000	130,000
Total	**943,755**	**1,310,000**	**1,310,000**
Transfer of waste to Bioreactor or ARC			
From IMF (t/year)	671,630	900,000	900,000
From MBT (t/year)	68,398	100,000	100,000
From local area (t/year)	130,000	130,000	130,000
Total	**870,028**	**1,130,000**	**1,130,000**
To Bioreactor (t/year)	870,028	1,130,000	750,000
To ARC (t/year)	0	0	380,000
Total	**870,028**	**1,130,000**	**1,130,000**
Electricity generation			
Bioenergy Power Station (MWh/year)	52,845	113,328	75,492
ARC (MWh/year)	0	0	240,000

Assessment of ARC emissions has included recognition of changes to the entire Eco Precinct emissions based on the interdependencies of many of the emission sources. For example, a portion of waste feedstock approved for on-site disposal to the Bioreactor will be diverted to the ARC, reducing emissions generated by the Bioreactor.

Operational activities included in the calculation of emissions are identified in Table 8.8.

Table 8.8 Operational activities included in the GHG assessment

Scope	Activity	Scenario		
		Baseline	Scenario 1	Scenario 2
Scope 1	On-site combustion of liquid fuels (diesel, petrol, petroleum oil)	✓	✓	✓
	On-site combustion of landfill gas	✓	✓	✓
	On-site flaring of landfill gas	✓	✓	✓
	On-site fugitive emissions of landfill gas	✓	✓	✓
	On-site sulfur hexafluoride (SF_6) emissions	✓	✓	✓
	On-site thermal treatment of waste for electricity generation (ARC)	-	-	✓
	On-site transport of residue to air pollution control residue (APCr) cell	-	-	✓
Scope 2	Purchased electricity[(a)]	✓	✓	✓
Scope 3	Transport of waste from Banksmeadow/Clyde to IMF by rail	✓	✓	✓
	Transport of waste from IMF to Eco Precinct by road	✓	✓	✓
	Transport of local waste to Eco Precinct by road	✓	✓	✓
	Combustion of liquid fuels[(b)]	✓	✓	✓
	Purchased electricity[(a)]	✓	✓	✓
	Employee travel[(c)]	✓	✓	✓

(a) Indirect emissions from electricity lost in delivery in the transmission and distribution network.

(b) Indirect emissions from the extraction, production and transport of diesel, petrol and petroleum oils used on-site.

(c) Indirect emissions from fuel use for employee travel.

8.3.2 Potential Impacts

i Predicted greenhouse gas emissions

There are two key GHG impacts in relation to this project. The first is the GHG emissions generated from operation of the project (Scenario 2, Scope 1 and Scope 3 – Table 8.8 above).

The second is the substituted electricity impact, namely the GHG implications of the electricity generated at the Eco Precinct (Scenario 2, Scope 2 – Table 8.8 above). The export of electricity from the Eco Precinct to the grid would effectively substitute electricity produced from other sources and represents a GHG offset (negative emission) for the project. For each scenario, the single-year GHG offsets for substituted electricity were calculated by multiplying the numbers of MWh produced by the unit emission factor for grid electricity in NSW from DISER (2021a)[5]. This unit emission factor was 0.79 tCO_2-e/MWh.

[5] Table 5 of DISER (2021a): Indirect (scope 2) emission factors for consumption of purchased electricity or loss of electricity from the grid.

Operational emissions in each scenario, and the emission benefits associated with substituted electricity are summarised in Table 8.9. When the substitution of electricity is taken into account in Scenario 2 (with the ARC), the net operational emissions were 74,611 t CO_2-e/year. This represents an overall reduction of 50% compared with Scenario 1, the do-nothing option.

Table 8.9 Summary of operational GHG emissions

	GHG emissions (t CO_2-e/year)		
	Baseline (current)	**Scenario 1 (approved operations, no ARC)**	**Scenario 2 (approved operations with ARC)**
Operation	117,228	238,072	323,850
Substituted electricity	-41,747	-89,458	-249,239
Total (net)	**75,481**	**148,614**	**74,611**

The significance of the project's GHG emissions has been estimated through comparison with NSW and relative to national GHG emissions. The NSW and national results were taken from the Australian Greenhouse Emissions Information System (AGEIS)[6], and for the calendar year 2019. Specifically, the 2019 emission totals for NSW and Australia were 136,579.03 kt CO_2-e and 529,297.7 kt CO_2-e respectively.

The net emissions for Scenario 2 of 74,611 t CO_2-e/year represented 0.01% of national GHG emissions, and 0.05% of GHG emissions in NSW.

Therefore, the project represents an opportunity to save up to 74,000 t CO_2-e per year. This is equivalent to the annual emissions from about 32,400 cars in Australia.[7]

The LCA (Appendix R) utilised a different methodology to come to a supporting conclusion, noting that "the results of the LCA show that 1 MWh of residual MSW and C&I waste-based power generation system performs better across all environmental impact categories assessed compared to an equivalent 1 MWh coal-based power generation systems" (p.9).

ii Climate change risk

As noted above the project will provide greenhouse gas benefits when compared to both the do-nothing scenario, and when compared to the generation of coal fired electricity.

In terms of climate change resilience, the following key risks have been identified and assessed:

Increased ambient temperatures and heatwaves

This risk refers to the impacts that increasing temperatures could have on the operations or structures of the project. Potential impacts include increased ambient temperature, increased frequency, duration and intensity of heatwave conditions, and increased risk of bushfire. The assessment found that provided the project is designed and constructed in accordance with all appropriate standards and taking account of climate change predictions, there is a low risk of adverse impacts.

6 https://ageis.climatechange.gov.au/SGGI.aspx

7 Based on an average emission rate of 181 g CO2-e per vehicle-km, and an annual distance of 12,600 km (2018, pre-COVID), for an average Australian car.

Rainfall and surface flooding

This risk refers to the potential for increased rainfall leading to surface inundation or flooding, and rising groundwater levels impacting the project. An assessment determined that the project sites are at low risk of inundation and provided that during detailed design, stormwater systems are designed appropriately to cater for risks in the project lifetime, there is a low risk of adverse impacts.

8.3.3 Management measures

The management measures recommended to manage climate change risk are summarised in Table 8.10.

Table 8.10 Climate change risk mitigation management measures

Impact/risk	ID	Measure	Timing
Climate change	CC1	During detailed design, climate change risk is to be considered during design of structures and stormwater infrastructure.	Detailed design
Climate change plan operations	CC2	The basis of design for the plant will consider the operational aspects related to increased ambient temperatures and heatwave conditions.	Detailed design
Climate change project design	CC3	Project design and landscaping be undertaken in accordance with appropriate standards to manage bushfire risk.	Detailed design

8.4 Noise and vibration

8.4.1 Introduction

A noise and vibration impact assessment (NVIA) has been prepared by EMM and is provided in Appendix S. The NVIA was prepared with reference to relevant guidelines and policies and in general accordance with the following:

- *NSW Noise Policy for Industry* (NPfI) (EPA 2017);
- *Interim Construction Noise Guideline* (ICNG) (NSW Department of Environment Climate Change (DECC) 2009);
- *Road Noise Policy* (RNP) (NSW Department of Environment Climate Change and Water (DECCW) 2011);
- DEC (2006) *Assessing Vibration: a technical guideline;*
- *Construction noise and vibration strategy* (V4.1 Transport for NSW, 2019) (CNVS);
- Australian Standard AS 1055:2018 – *Acoustics – Description and measurement of environmental noise – General Procedures*;
- BS 6472-1– 2008, *Evaluation of human exposure to vibration in buildings* (1–80 Hz);
- Standards Australia AS/NZS 2107:2016 (AS2107) – *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors*; and
- International Standard ISO 9613-2:1996 – Acoustics – Attenuation of sound during propagation outdoors.

The relevant SEARs and how they are addressed, are summarised in Appendix A and Section 1.4 of the NVIA (Appendix S).

This chapter summarises the NVIA. It describes the noise assessment criteria, which apply to the project, potential noise sources, modelling method and results, potential impacts and mitigation measures where impacts are unavoidable.

8.4.2 Existing environment

i Existing project noise limits and measures

Existing development consent conditions for Veolia's existing operations provide noise criteria which operations are required to meet. Veolia's 2020 Annual Environmental Management Report (AEMR 2020) identifies that current noise emissions from waste management operations that could potentially impact nearby sensitive locations are within the consent condition criteria. Veolia has implemented noise mitigation measures that include:

- waste filling operations occurring below ground level;
- road transport code of conduct;
- waste operations occurring within approved specified hours; and
- acoustic enclosures.

Noise monitoring, identified within the 2020 AEMR, is required at two locations, which are the closest sensitive locations. Operator attended monitoring was undertaken at both locations with noise levels recorded below the 35 dB criteria.

The Eco Precinct is currently licensed by the EPA under the following EPLs:

- EPL 11436: Woodlawn landfill including: waste disposal (application to land); and
- EPL 20476: Woodlawn MBT facility including: composting, resource recovery, and waste storage.

Specifically for noise from the Bioreactor, the following limit (EPL 11436) is imposed:

L4 Noise Limits

L4.1 Noise from the premises must not exceed 35 dB(A) LAeq (15 minute) at the most affected residential receiver.

Where LAeq means the equivalent continuous noise level – the level of noise equivalent to the energy-average of noise levels occurring over the measurement period.

For noise from the Eco Precinct, the following limit (EPL 20476) is imposed for the MBT:

L4 Noise Limits

L4.1 Noise from the premises must not exceed 40 dB(A) LAeq (15 minute) at Torokina and Willeroo.

ii Assessment locations

The nearest representative noise sensitive locations to the project (hereafter referred to as 'assessment locations') were selected to represent the range and extent of potential noise impacts and are listed in Table 8.11 and their locations are shown in Figure 8.9.

Table 8.11 Noise assessment locations

ID	Assessment location (* Veolia owned)	Classification	Distance to ARC building (m)	Easting	Northing
R1*	Woodlawn Farm	Residential	1100	734518	6118363
R2*	Cowley Hills	Residential	1100	736673	6117689
R3*	Pylara	Residential	3500	737493	6114373
R4	Torokina	Residential	4150	731287	6114653
R5	Willeroo	Residential	5800	730260	6120684
IN6	Woodlawn Mine administration offices	Industrial	350	735539	6117298

iii Existing ambient noise levels

Given the rural nature of the locality and based on historical noise data collected in the vicinity, existing ambient noise levels are at or below the minimum levels provided in the NPfI (EPA 2017). Therefore, as per the NPfI, the minimum rating background level for daytime is 35 dB and for evening and night is 30 dB.

8.4.3 Overview of assessment methods

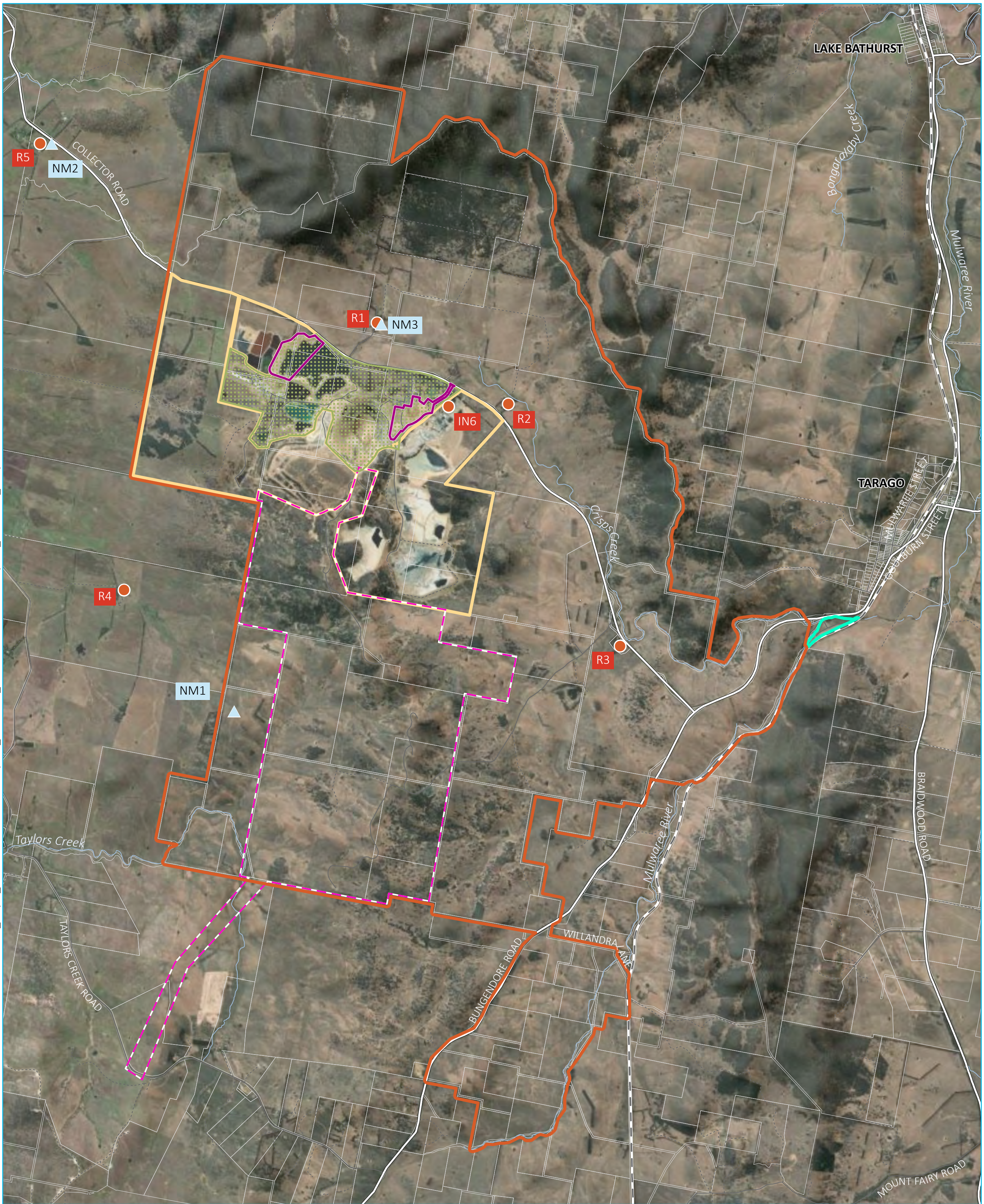
This section presents the methods and base parameters used to model operational and construction noise and vibration emissions from the operation of the project. It also considers the cumulative impact of other approved operations at the Eco Precinct.

Operational and construction noise levels were predicted using the CONCAWE algorithm as implemented within SoundPLAN. This algorithm is accepted by the EPA.

The model was populated with 3-D topography of the project and surrounding area, extending past the nearest assessment locations. Plant and equipment representing the range of proposed operation and construction scenarios was modelled at locations representing the worst-case noise levels for assessment locations.

Operational and construction noise emissions from the project have been assessed at assessment locations, which comprise private residences and an industrial premises. Details of the assessment locations are described in Table 8.11 above and are shown in Figure 8.9.

Further detail on the noise impact assessment method for construction and operation is described in Sections 4 and 5 of the NVIA (Appendix S).



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Source: EMM (2022); VEOLIA (2022); DFSI (2017)

0 1 2 km

GDA 1994 MGA Zone 55

N

KEY

- Development footprint
- Noise assessment location
- Noise monitoring location
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse
- Cadastral boundary

Noise monitoring and assessment locations

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.9

creating opportunities

i Construction noise

Construction activities associated with the project have been assessed based on 24 hours per day, seven days a week over approximately three years.

Acoustically significant fixed and mobile equipment items were assumed to have 100% utilisation to represent a key range of activities likely to be undertaken during the main construction works. A summary of the construction phases, duration, number of plant and cumulative sound power levels (Lw) are presented in Table 5.6 of the NVIA (Appendix S). The model considered the cumulative plant and equipment sound power level as an area source across the project providing a potential worst-case scenario.

Construction sleep disturbance

Intermittent noise and assessment of sleep disturbance at residential assessment locations has been considered. For the purpose of assessing sleep disturbance at residences, a L_{Amax} level of 118 dB was considered associated with a metal on metal impact, petrol powered concrete saw or similar high noise level event.

Construction vibration

The Construction Noise and Vibration Strategy (CNVS) sets out safe working distances to achieve the cosmetic damage and human response criteria for vibration. The key vibration generating sources are vibratory rollers, which will be used for ground compaction. The safe working distances are presented in Table 8.12 below and have been used to assess the potential for construction vibration impacts based on proposed activities.

Table 8.12 Recommended safe working distances for vibration intensive plant

Plant Item	Rating/description	Safe working distance	
		Cosmetic damage (BS 7385)	Human comfort (BS 6472)
Vibratory Rollers	<50 kN (typically 12 tonnes)	5 m	15 to 20 m
	<100 kN (typically 24 tonnes)	6 m	20 m
	<200 kN (typically 46 tonnes)	12 m	40 m

Source: From Transport Infrastructure Development Corporation Construction's Construction Noise Strategy (Rail Projects), November 2007 – based on residential building.

Safe work distances relate to continuous vibration. For most construction activity, vibration emissions are intermittent in nature. The safe working distances are therefore conservative.

Construction noise management levels

Predicted noise levels were assessed against the ICNG noise criteria. The ICNG recommends noise management levels (NMLs) to reduce the likelihood of noise impacts arising from construction activities.

The project construction NMLs for recommended standard and out of hour periods are presented in Table 8.13 for all assessment locations. Construction activities associated with the project have been assessed based on 24 hours per day, seven days a week over approximately three years.

Table 8.13 Construction noise management levels – all assessment locations

Assessment location	Period	Adopted RBL	NML $L_{Aeq,15min}$, dB
R1–R5	Day (standard ICNG hours)	35	45
	Day (OOH)	35	40
	Evening (OOH)	30	35
	Night (OOH)	30	35
IN6	When in use	n/a	70

ii Operational noise

The NVIA has been based on the project layout described in Chapter 4 (Figure 4.1and Figure 4.2), with plant and equipment principally located within the ARC building and the only external plant being the air cooled condensers on the northern side of the ARC building. Peak hour truck movements assessed in the NVIA are outlined in the traffic impact assessment (Appendix T).

Noise attenuation provided by the structure and cladding of the ARC building, detailed in Section 5.2.1 of the NVIA (Appendix S), has been assumed to be equivalent to the Four Ashes Energy Recovery Facility (ERF) at Staffordshire, which is the reference facility as described in Section 6.3 (Scott Wilson 2010).

Indicative plant and equipment of acoustic significance and associated sound power levels for the project are presented in Table 5.5 of the NVIA (Appendix S). The list is based on information provided by Veolia and data available for the reference facility.

Key noise generating activities and sources from the project during operation will include:

- ARC building and surrounds: noise sources within and external to the ARC building include road waste trucks, waste bunker and tipping hall, turbine hall, bottom ash outlet and conveyor, boiler hall, air cooled condenser and discharge stack. Sound power levels for these sources have been calculated and included in the model.
- IBA area: front end loader and excavator at IBA maturation pad windrows, and IBA maturation building housing trommel, vibratory screen, separators and eddy current separators.
- APCr encapsulation cell activities: dozer, front end loader, excavator, lighting tower and compressor operating at the encapsulation cell.
- Mobile plant: trucks transporting APCr from the ARC building to the encapsulation cell.

Operational sleep disturbance

The project will operate 24 hours per day/7 days per week, hence assessment of intermittent noise and potential for sleep disturbance at residential assessment locations during the night-time hours (10.00 pm to 7.00 am) is required by the NPfI. For assessment of sleep disturbance, a sound power level of 119 dBA L_{Amax} was considered for airbrake release of site trucks (6.00 am to 7.00 am). The areas with the greatest potential for this to occur are the weighbridges on the east and north west of the ARC building, and container storage and truck manoeuvring area.

Operational noise prediction levels

Noise levels at the assessment locations were predicted based on the noise sources outlined in Table 5.5 of the NVIA (Appendix S). The overall $L_{Aeq,15min}$ noise contribution was modelled for direct assessment against NPfI project noise trigger levels (PNTLs).

Noise emissions from industry can be significantly influenced by prevailing weather. Light stable winds (<3 metres per second (m/s)) and temperature inversions have the potential to increase noise at a receiver (noise enhancing conditions). The assessment and model utilised the noise enhancing meteorological conditions as follows:

- day – 20°C, 60% humidity and 3 m/s wind for all assessment locations;
- evening – 20°C, 60% humidity and 3 m/s wind for all assessment locations; and
- night – 10°C, 90% humidity and 2 m/s wind and temperature inversion for all assessment locations.

Both the increase in noise level above background levels (ie the intrusiveness of a source) and the absolute noise level, are important in determining how a community will respond to noise from industrial sources. To ensure both of these factors are considered, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The fundamental difference being intrusiveness noise levels apply over 15 minutes in any period (day, evening or night), whereas the amenity noise levels apply to the entire assessment period (day, evening or night).

PNTLs as per the NPfI, are the more stringent of either the project intrusive or amenity noise levels. Details of the project intrusive noise level, the amenity noise level and the resulting PNTLs for day, evening and night periods are provided in Section 4.1.2 of the NVIA (Appendix S). The PNTLs provide a benchmark for assessing a proposed or existing industrial development. A summary of the PNTLs for the assessment of noise from the project operations is presented in Table 8.14.

Table 8.14 Project noise trigger levels – operation

Assessment location	Assessment period[1]	Intrusiveness noise level, $L_{Aeq,15min}$, dB	Amenity noise level[2], $L_{Aeq,15min}$, dB	PNTL[3], $L_{Aeq,15min}$, dB
R1–R5	Day	40	48	40
	Evening	35	43	35
	Night	35	38	35
IN6	When in use	n/a	68	68

1. Day: 7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sundays and public holidays; evening: 6.00 pm to 10.00 pm; 6.00 am to 7.00 am Monday to Saturday, 6.00 am to 8.00 am Sundays and public holidays; night: remaining periods.
2. Project amenity $L_{Aeq,15min}$ noise level is the recommended amenity noise level $L_{Aeq,period}$ +3 dB as per the NPfI.
3. PNTL is the lower of the calculated intrusiveness or amenity noise levels.

iii Road traffic noise

Road traffic noise has been assessed for Collector Road and Bungendore Road, the primary routes associated with the construction and operation of the project. Road traffic noise levels from the project have been assessed considering the increase in traffic associated with the project compared to existing traffic noise. Existing average daily traffic movements for Collector Road and Bungendore Road were established from classified tube counts conducted in September 2021 (Appendix T).

The principal guidance to assess the impact of road traffic noise is in the *NSW Road Noise Policy* (RNP) (EPA 2011) Table 8.15 presents the road noise assessment criteria for residential land uses (ie assessment locations), relevant to the project. Under the definitions of the NSW RNP, Collector Road and Bungendore Road will be sub-arterial roads. Additionally, the RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to an increase of up to 2 dB.

Table 8.15 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria – dBA		Total traffic noise level increase – dBA	
		Day (7.00 am to 10.00 pm)	Night (10.00 pm to 7.00 am)	Day (7.00 am to 10.00 pm)	Night (10.00 pm to 7.00 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeway/ arterial/ sub-arterial roads generated by land use developments	$L_{eq,15hr}$ 60 (external)	$L_{eq,9hr}$ 55 (external)	Existing traffic $L_{eq(15-hr)}$+12 dB (external)	Existing traffic $L_{eq(9-hr)}$+ 12 dB (external)

The full methodology undertaken for the road traffic noise assessment is detailed in the NVIA (Appendix S).

8.4.4 Potential impacts

i Construction noise

Predicted construction noise levels for the project are presented in Table 8.16 for standard day periods under noise enhancing conditions. The level presented for each assessment location represents the energy-average noise level over a 15 minute period and assumes all plant operating concurrently. No exceedances of the ICNG NML are predicted at any assessment location.

Table 8.16 Predicted construction noise levels

Assessment location	Description	Period[1]	Noise affected NML, dB	Highly noise affected NML, dB	Predicted construction noise level, dB $L_{Aeq,15min}$	Level above NML[2]
Stage 1: Initial site preparation works/Bulk earthworks						
R1	Woodlawn Farm3	Standard	45	75	35	Nil
R2	Cowley Hills3	Standard	45	75	35	Nil
R3	Pylara3	Standard	45	75	<30	Nil
R4	Torokina	Standard	45	75	<30	Nil
R5	Willeroo	Standard	45	75	<30	Nil
IN1	Woodlawn Mine Administration	Any period	70	n/a	45	Nil

Table 8.16 Predicted construction noise levels

Assessment location	Description	Period[1]	Noise affected NML, dB	Highly noise affected NML, dB	Predicted construction noise level, dB $L_{Aeq,15min}$	Level above NML[2]
Stage 2: Concrete hardstand, lower walls, bunker and roadway						
R1	Woodlawn Farm[3]	Standard	45	75	34	Nil
R2	Cowley Hills[3]	Standard	45	75	35	Nil
R3	Pylara[3]	Standard	45	75	<30	Nil
R4	Torokina	Standard	45	75	<30	Nil
R5	Willeroo	Standard	45	75	<30	Nil
IN1	Woodlawn Mine Administration	Any period	70	n/a	45	Nil
Stage 3: Building structure and erection						
R1	Woodlawn Farm[3]	Standard	45	75	32	Nil
R2	Cowley Hills[3]	Standard	45	75	33	Nil
R3	Pylara[3]	Standard	45	75	<30	Nil
R4	Torokina	Standard	45	75	<30	Nil
R5	Willeroo	Standard	45	75	<30	Nil
IN1	Woodlawn Mine Administration	Any period	70	n/a	44	Nil

Notes: 1. Standard hours (7.00 am to 6.00 pm Monday to Friday, 8.00 am to 1.00 pm Saturday and no work on Sunday or public holidays.

2. Level above NML for Standard hours only.

3. Owned by Veolia.

Table 8.16 confirms that construction noise levels from the project during day, evening and night are predicted to comply with NMLs at all assessment locations and do not exceed the NMLs. Certain phases of the construction of the project would require 24/7 construction activities. Predicted levels in Table 8.16 confirm that the night NML of 35 dB would also be satisfied for these activities.

With the effective management and incorporation of mitigation and management measures listed in Section 8.4.5 construction noise and vibration emissions from the project can be managed to minimise impacts.

Modelling of intermittent noise events from construction activities that could cause sleep disturbance and which may occasionally occur at night (typically during the morning shoulder period 6.00 am–7.00 am) were assessed. The approach considered a typical worst-case event for metal on metal impact or concrete saw cutting and a source sound power level of 118 dB L_{Amax}. Potential for these events were considered at multiple locations within the proposed hardstand and building areas and predicted to the identified residential assessment locations. Noise predictions under noise enhancing conditions are presented in Table 8.17. All predicted intermittent noise levels comply with the screening level for sleep disturbance.

Table 8.17 Predicted intermittent noise levels

Assessment location	Description	Period	Screening level, dB	Predicted intermittent noise level, dB L_{Amax}
R1	Woodlawn Farm*	Night	52	46
R2	Cowley Hills*	Night	52	47
R3	Pylara*	Night	52	<30
R4	Torokina	Night	52	<30
R5	Willeroo	Night	52	<30

* Owned by Veolia.

ii Construction vibration

In relation to human comfort response, the safe working distances Table 8.5 in Section 8.4.3 relate to continuous vibration and apply to residential assessment locations. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are acceptable, as discussed in BS 6472-1.

The nearest residence (R2) is located more than 800 m to the closest proposed construction activities for the new site access. This assessment location is outside the safe working distances of likely plant, required to maintain acceptable human response and structural vibration levels. Vibration impacts from construction at all assessment locations are therefore highly unlikely.

iii Construction road traffic

In accordance with the RNP, Collector Road and Bungendore Road are classified as sub-arterial roads. Based on traffic volumes calculated in the traffic impact assessment (refer to Section 8.5 and Appendix T, a summary of the calculated existing and predicted future road traffic noise levels are presented for day and night periods in Table 8.18 and Table 8.19 respectively. The assessment assumed all project construction traffic travelling east on Collector Road and north on Bungendore Road through Tarago in order to consider a worst-case impact assessment.

Table 8.18 Road traffic noise calculations – day (7 am to 10 pm)

Road segment	Approximate distance of residential façade from nearest carriageway	Existing movements	Existing plus project movements	RNP Criteria L_{Aeq}	Noise level increase due to the Project, $L_{Aeq,15hr}$
		Calculated level, $L_{Aeq,15hr}$	Predicted level, $L_{Aeq,15hr}$		
Collector Road	75 m	57.3	57.6	60	0.3
Bungendore Road	23 m	63.8	64.3	60	0.5

Predicted noise levels for Collector Road and Bungendore Road during the day confirm relative increases of 0.3 dB and 0.5 dB, respectively, and hence satisfy the RNP requirements which requiring a relative increase in traffic to be less than 2 dB, where existing traffic levels already exceed the relevant RNP criteria.

Table 8.19 Road traffic noise calculations, Night (10 pm to 7 am)

Road segment	Approximate distance of residential façade from nearest carriageway	Existing movements	Existing plus project movements	RNP Criteria L_{Aeq}	Noise level increase due to the Project, $L_{Aeq,9hr}$
		Calculated level, $L_{Aeq,9hr}$	Predicted level, $L_{Aeq,9hr}$		
Collector Road	75 m	50.4	50.7	55	0.3
Bungendore Road	23 m	56.0	57.1	55	1.1

Predicted noise levels for Collector Road and Bungendore Road during the night confirm relative increases of 0.3 dB and 1.1 dB respectively and hence satisfy the RNP requirements for relative increases in traffic noise to be less than 2 dB.

iv Operational noise

a Single point predictions

Predicted single point operational noise levels are provided in Table 8.20 for day, evening and night operations of the project, with corresponding noise contours shown on Figure 8.10, Figure 8.11 and Figure 8.12. The levels presented for each assessment location represents the energy-average noise level over a 15 minute period and assumes all plant and activities operating concurrently in accordance with scenarios outlined in Section 5.2 of the NVIA (Appendix S) under noise enhancing conditions. The $L_{Aeq,15min}$ noise level contributions (Table 8.20) comply with the limit of 40 dB at all residential assessment locations.

Table 8.20 Predicted operational noise levels

Assessment location	Description	Period	PNTL, $dBL_{Aeq,15min}$	Predicted project noise level, dB $L_{Aeq,15min}$
R1	Woodlawn Farm*	Day	40	37
		Evening	35	<30
		Night	35	<30
R2	Cowley Hills*	Day	40	33
		Evening	35	<30
		Night	35	<30
R3	Pylara*	Day	40	<30
		Evening	35	<30
		Night	35	<30
R4	Torokina	Day	40	<30
		Evening	35	<30
		Night	35	<30

Table 8.20 Predicted operational noise levels

Assessment location	Description	Period	PNTL, dB$L_{Aeq,15min}$	Predicted project noise level, dB $L_{Aeq,15min}$
R5	Willeroo	Day	40	<30
		Evening	35	<30
		Night	35	<30
IN6	Woodlawn Mine Administration	When is use	68	42

* Veolia owned.

The modelling results indicate compliance with the PNTLs for all assessment locations. Daytime noise levels are higher than evening and night principally as a result of the fixed and mobile plant associated with the IBA area and APCr encapsulation cell activities occurring during the daytime period only.

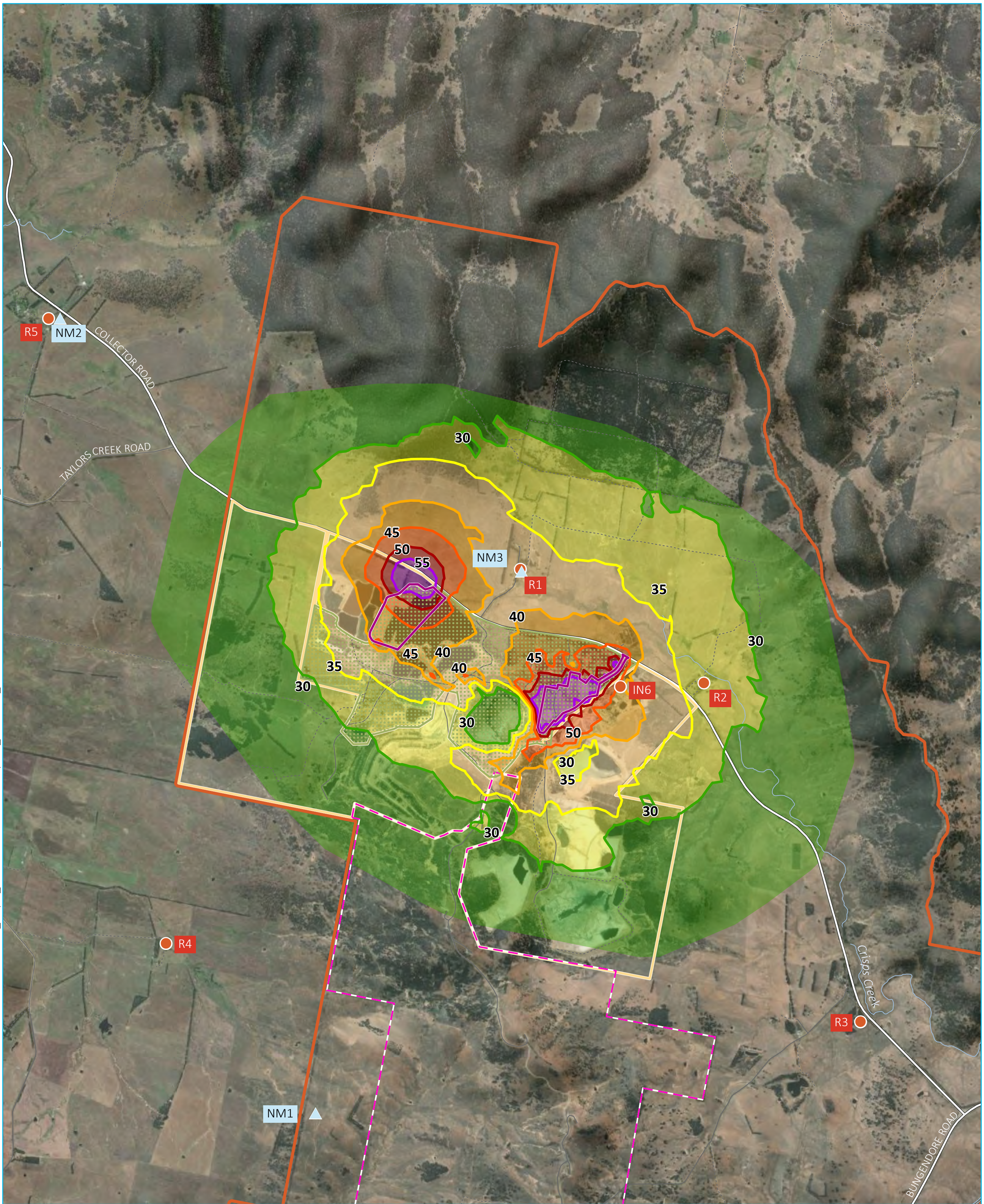
b Cumulative noise

Noise levels from the project have the potential to result in cumulative impacts with other noise sources from existing operations at the Eco Precinct. Other primary noise sources at the Eco Precinct that contribute to noise emissions include the:

- MBT Facility;
- Woodlawn Wind Farm;
- Bioreactor landfill; and
- Woodlawn Mine.

Noise level contributions from these sources have been extracted from previous environmental noise assessments (PB 2012b and SLR 2013) in order to review the potential for cumulative noise impacts. A noise audit at the Eco Precinct, comprising site attended measurements of plant and equipment, and attended noise measurements at assessment locations (R1, R2, R4 and R5), was undertaken on 4 April 2022. The purpose of the audit was to validate the predictions used from previous noise assessments. The audit confirmed that noise emissions from the Eco Precinct (including the noise sources listed above) were inaudible at assessment locations R2, R4 and R5 with noise contributions less than 30 dB. It is therefore assumed that contributions would be less than 30 dB at all other private residential assessment locations. Noise from the Eco Precinct was audible at R1 (Woodlawn Farm, owned by Veolia).

Simultaneous operation of the project and other approved operations at the Eco Precinct were assessed as a worst-case scenario by adding the $L_{Aeq,15min}$ predicted intrusive noise level from the project to noise from approved operations. In order to compare the cumulative intrusive noise level with the recommended equivalent amenity noise levels, the intrusive level is reduced by 3 dB, in accordance with the NPfI.



Source: EMM (2022); VEOLIA (2022); DFSI (2017)

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GDA 1994 MGA Zone 55

N

KEY

- Development footprint
- Noise assessment location
- Noise monitoring location
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm

Noise contours (dB_{LAeq})

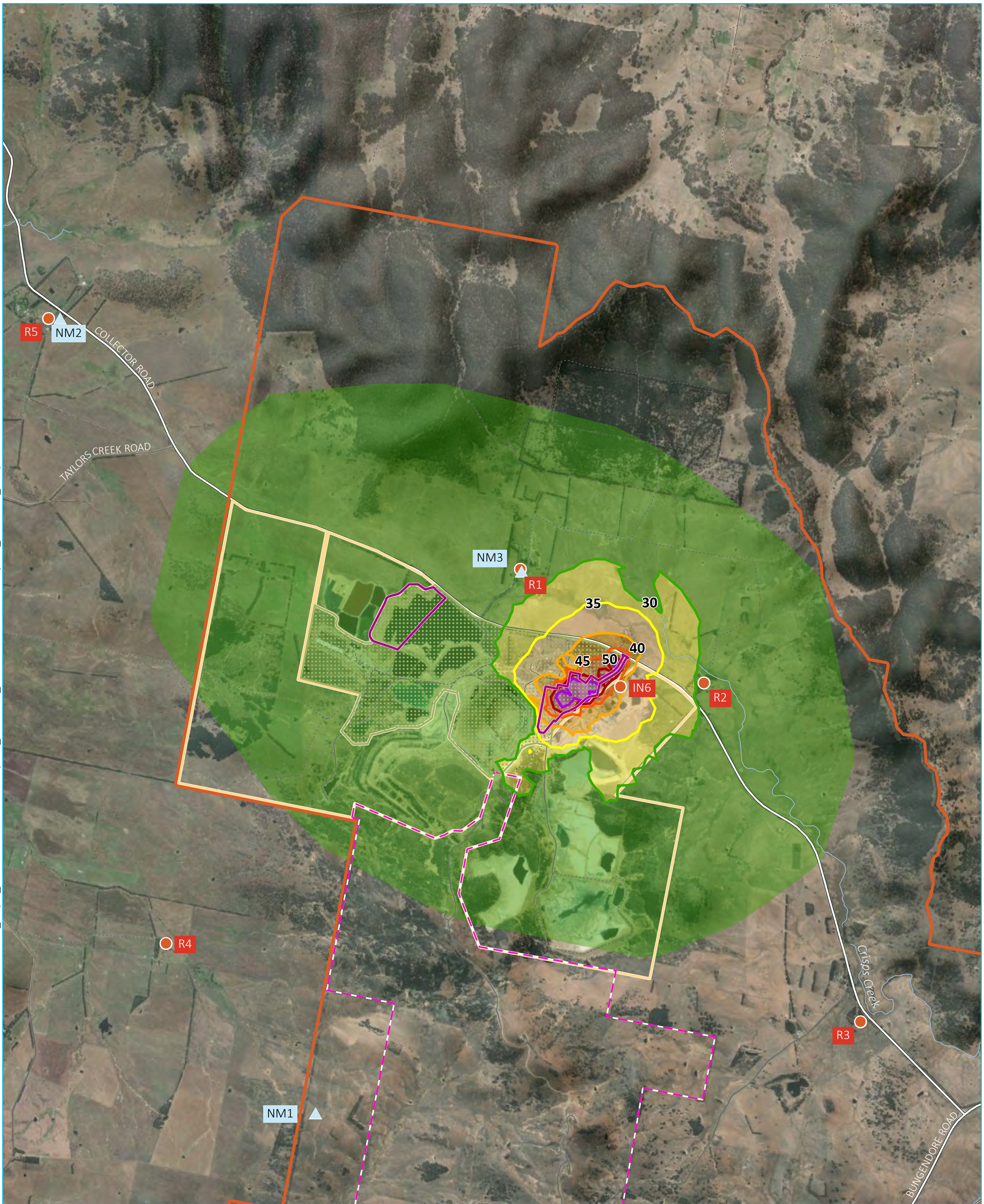
- 30
- 35
- 40
- 45
- 50
- 55

- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Operational noise contours, day, 3 m/s wind

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.10

creating opportunities



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Source: EMM (2022); VEOLIA (2022); DFSI (2017)

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- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm

Noise contours (dB_{LAeq})

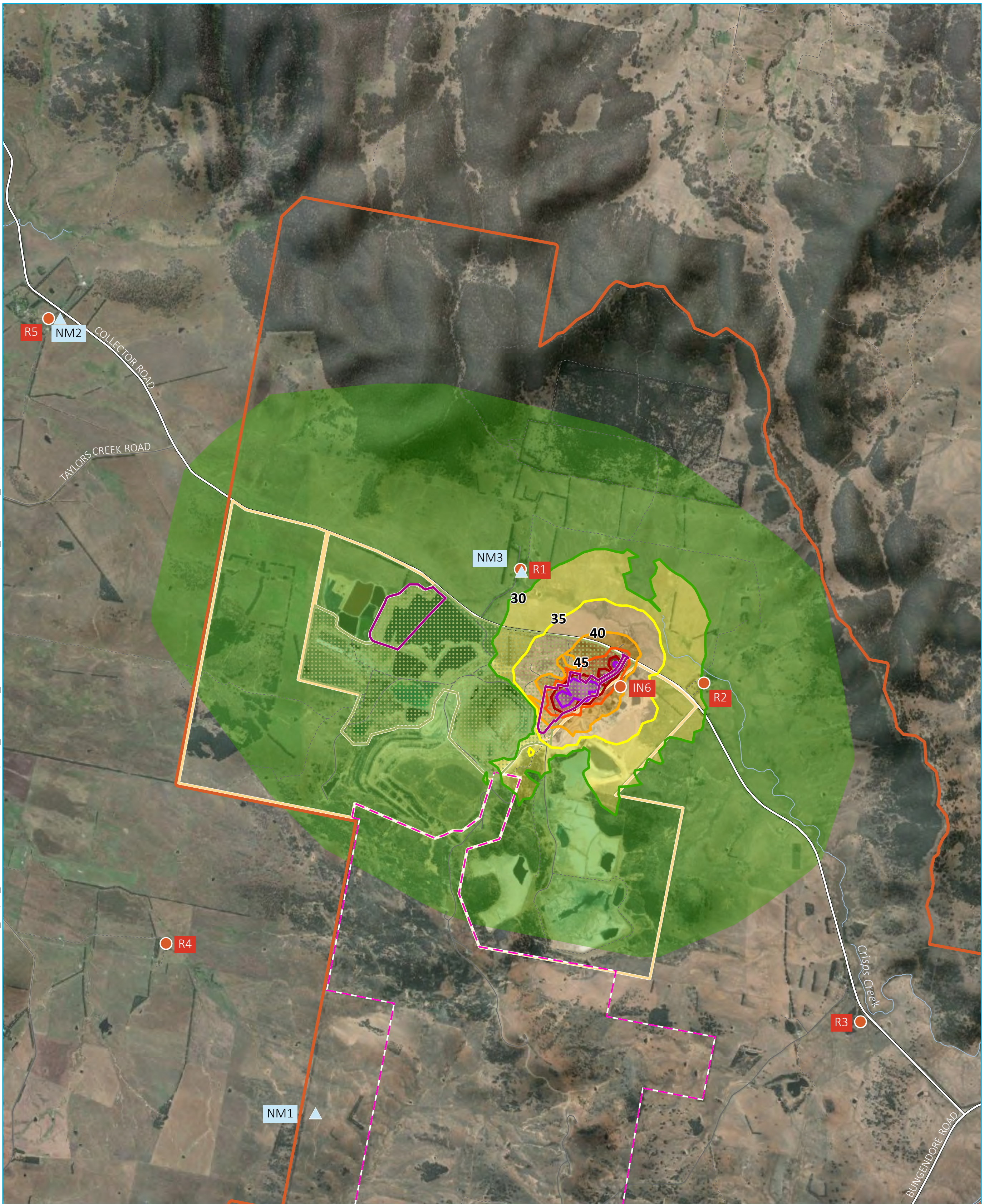
- 30
- 35
- 40
- 45
- 50
- 55

- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Operational noise contours, evening, 3 m/s wind

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.11

EMM
creating opportunities



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Source: EMM (2022); VEOLIA (2022); DFSI (2017)

0 1 2 km
GDA 1994 MGA Zone 55
N

KEY

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- Veolia integrated waste management operations
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- Woodlawn Mine operations area
- Woodlawn Wind Farm

Noise contours (dB_{LAeq})

- 30
- 35
- 40
- 45
- 50
- 55

- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Operational noise contours, night, 2m/s wind and temperature inversion

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.12

creating opportunities

A summary of the individual contributions of each of the primary noise sources, cumulative noise level and amenity noise criteria is provided in Table 8.21, Table 8.22 and Table 8.23.

Table 8.21 Cumulative amenity noise levels (Day), L_{Aeq}

Assessment location	Description	MBT Facility	Woodlawn Wind Farm	Bioreactor	Woodlawn Mine	The ARC project	Cumulative Amenity Level[1]	NPfI Recommended Amenity Level
R1	Woodlawn Farm *	<30	<30	35	40	36	40	50
R2	Cowley Hills*	<30	<30	34	44	33	42	50
R3	Pylara*	<30	<30	<30	32	<30	34	50
R4	Torokina	<30	<30	<30	<30	<30	33	50
R5	Willeroo	<30	<30	<30	<30	<30	33	50

1. Represented cumulative intrusive noise level -3 dB.

* Owned by Veolia.

Table 8.22 Cumulative amenity noise levels (Evening), L_{Aeq}

Assessment location	Description	MBT Facility	Woodlawn Wind Farm	Bioreactor	Woodlawn Mine	The ARC project	Cumulative Amenity Level[1]	NPfI Recommended Amenity Level
R1	Woodlawn Farm*	<30	<30	35	40	<30	39	45
R2	Cowley Hills*	<30	<30	34	44	<30	42	45
R3	Pylara*	<30	<30	<30	32	<30	34	45
R4	Torokina	<30	<30	<30	<30	<30	33	45
R5	Willeroo	<30	<30	<30	<30	<30	33	45

2. Represented cumulative intrusive noise level -3 dB.

* Owned by Veolia.

Table 8.23 Cumulative amenity noise levels (Night), L_{Aeq}

Assessment location	Description	MBT Facility	Woodlawn Wind Farm	Bioreactor	Woodlawn Mine	The ARC project	Cumulative Amenity Level[1]	NPfI Recommended Amenity Level
R1	Woodlawn Farm*	<30	<30	35	40	<30	39	40
R2	Cowley Hills*	<30	<30	33	44	<30	42	40
R3	Pylara*	<30	<30	<30	32	<30	34	40
R4	Torokina	<30	<30	<30	<30	<30	33	40
R5	Willeroo	<30	<30	<30	<30	<30	33	40

3. Represented cumulative intrusive noise level -3 dB.

* Owned by Veolia.

The project does not contribute to overall noise levels at any of the assessment locations and does not require further review. The cumulative amenity noise levels are also less than the NPfI recommended amenity level for all assessment locations.

During the night period the cumulative amenity noise level exceeds the acceptable level of 40 dBA at R2 Cowley Hills and is principally controlled by noise emissions from Woodlawn Mine. R2 Cowley Hills is owned by Veolia and as such is considered project-related for the purpose of this assessment.

c Sleep disturbance

Modelling of intermittent maxima noise events at night considered a typical worst-case event for air brake release and a source sound power level of 119 dB L_{Amax}. Potential for these events was considered at the eastern and north-western weighbridges, container storage and truck manoeuvring area and predicted to the identified residential assessment locations. The results of the predictions under ISO9613 conditions are presented in Table 8.24.

Table 8.24 Predicted intermittent noise levels – ISO9613

Assessment location	Description	Period	Screening level, dB	Predicted intermittent noise level, dB L_{Amax}
R1	Woodlawn Farm*	Night	52	47
R2	Cowley Hills*	Night	52	48
R3	Pylara*	Night	52	<30
R4	Torokina	Night	52	<30
R5	Willeroo	Night	52	<30

* Owned by Veolia.

The modelled results are below the L_{Amax} sleep disturbance screening level for all residential assessment locations and below the $L_{Aeq,15min}$ noise level of 40 dB.

d Operational road traffic

The operational traffic assessment includes existing approved truck movements from the Crisps Creek IMF to the Woodlawn Eco Precinct in addition to traffic associated with the ARC operations, providing a conservative assessment of potential traffic noise impacts.

Table 8.25 Road traffic noise calculations – day (7.00 am to 10.00 pm)

Road segment	Approximate distance of residential façade from nearest carriageway	Existing movements	Existing plus project movements	RNP Criteria L_{Aeq}	Noise level increase due to the Project, $L_{Aeq,15hr}$
		Calculated level, $L_{Aeq,15hr}$	Predicted level, $L_{Aeq,15hr}$		
Collector Road	75 m	57.3	58.5	60	1.1
Bungendore Road	23 m	63.8	64.9	60	1.1

Calculations indicate that existing traffic noise levels on Bungendore Road exceed the RNP baseline $L_{Aeq,15hr}$ 60 dB. Predicted noise levels for Collector Road and Bungendore Road during the day confirm relative increases of 1.1 dB and hence satisfy the RNP requirements of a less than 2 dB increase.

Table 8.26 Road traffic noise calculations, night (10.00 pm to 7.00 am)

Road segment	Approximate distance of residential façade from nearest carriageway	Existing movements	Existing plus project movements	RNP Criteria L_{Aeq}	Noise level increase due to the Project, $L_{Aeq,9hr}$
		Calculated level, $L_{Aeq,9hr}$	Predicted level, $L_{Aeq,9hr}$		
Collector Road	75 m	50.4	51.4	55	1.0
Bungendore Road	23 m	56.0	57.1	55	1.1

Calculations confirm that existing traffic noise levels on Bungendore Road exceed the RNP baseline $L_{Aeq,9hr}$ 55 dB Predicted noise levels for Collector Road and Bungendore Road during the night confirm relative increases of 1.0 dB and 1.1 dB respectively and hence satisfy the RNP requirements of a less than 2 dB increase.

8.4.5 Management measures

The management measures in Table 8.27 will be implemented to reduce impacts from noise generated during construction and operation of the project.

Table 8.27 Noise and vibration management and mitigation measures

Impact/risk	ID	Measure	Timing
Internal design noise levels	NV1	Space averaged internal noise levels to satisfy the assumptions presented in Table 5.5 of the NVIA.	Pre-construction/ design/operation
Building construction	NV2	Building construction materials and specification of discharge stack silencers will be in accordance with the assumptions presented in Section 5.2 of the NVIA.	Pre-construction/design

Table 8.27 Noise and vibration management and mitigation measures

Impact/risk	ID	Measure	Timing
Selection of plant and equipment	NV3	Specification for all plant and equipment to be in accordance with the noise levels presented in Table 5.5 of the NVIA.	Design/operation
Maintenance	NV4	Plant and equipment to be maintained to satisfy the ongoing noise levels referenced in Table 5.5 of the NVIA.	Operation
Noise management levels	NV5	Residents will be notified prior to works commencing. Noise monitoring during the initial stages of construction will be undertaken to determine if actual construction noise levels are above NMLs. If NMLs are exceeded, Veolia will identify feasible and reasonable mitigation measures that reduce construction noise levels to at or below NMLs where practical.	Pre-construction
Work practices	NV6	Regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration.	Construction
	NV7	Avoid the use of portable radios (CD player/speakers), public address systems or other methods of site communication that may unnecessarily impact upon nearby residents.	Construction
	NV8	Develop routes for the delivery of materials and parking of vehicles to minimise noise.	Construction
	NV9	Where possible, avoid the use of equipment that generates impulsive noise.	Construction
Plant and equipment	NV10	Where possible, choose quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks.	Construction
	NV11	Operate plant and equipment in the quietest and most efficient manner.	Construction
	NV12	Regularly inspect and maintain plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively.	Construction and operation
	NV13	Minimise the number of items of plant and equipment operating simultaneously while still meeting construction and processing requirements.	Construction
	NV14	Switch off idle plant.	Construction and operation

8.5 Traffic and transport

8.5.1 Introduction

A traffic impact assessment (TIA) has been prepared by EMM and is provided in Appendix T. The TIA was prepared with reference to relevant guidelines and policies, as outlined in Section 1.4 of the TIA. The relevant SEARs and how they are addressed, are summarised in Appendix A and Section 2 of the TIA (Appendix T). A summary of the existing environment, impact assessment and proposed mitigation measures is provided in this section.

8.5.2 Existing environment

The Eco Precinct is serviced by a network of roads used by vehicles accessing the site (refer Figure 8.13). These roads are:

- Braidwood Road – a north-south aligned state road between the township of Goulburn and Tarago. It is a sealed road and provides one lane each way and is approximately 3.5 m wide with 1 m shoulders on each side.

- Bungendore Road – a north-south aligned regional road between Tarago (Goulburn Street) and Tarago Road (south), its continuation which connects to Bungendore. It is a sealed road and provides one lane each way and is approximately 3.5 m wide with 1 m shoulders on each side.

- Collector Road – a local road between Bungendore Road (east) and Federal Highway (west) and provides access to the Eco Precinct. At the intersection with Veolia's existing access road to its waste management operations, it is give-way controlled and provides one full lane and one deceleration lane on approach and one lane on departure.

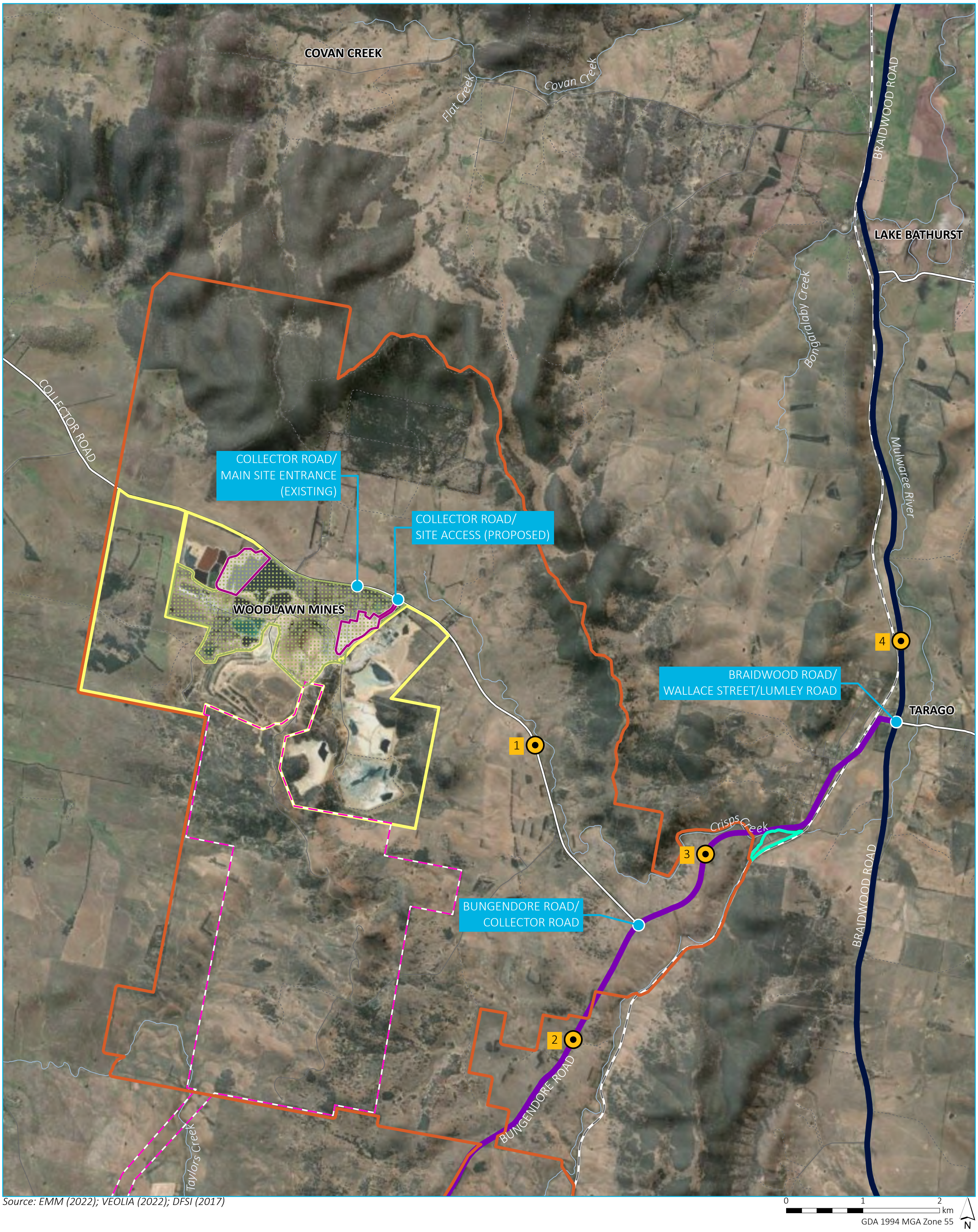
Key intersections relevant to the project include Collector Road and the existing site access, Bungendore Road/Collector Road, and Braidwood Road/Wallace Street. These intersections are shown in Figure 8.13. The intersections were surveyed from 6.00 am and 9.00 am, as well as from 3.00 pm to 6.00 pm on 12 August 2021. The result of the survey indicate that the network peak hours are 6.15 am–7.15 am and 4.15 pm–5.15 pm.

A program of tube counts was undertaken on Braidwood Road, Bungendore Road, Collector Road for a 14 day period between 12 August 2021 and 25 August 2021. The location of the tube counts is show in Figure 8.13. The program recorded the annual average daily traffic, weekly 85th percentile speed, and heavy vehicle percentages. The following findings were noted:

- Traffic volumes were highest at the survey locations 3 and 4. This is primarily because these points were located on regional and state roads respectively, and generally carry higher volumes of traffic between regional areas including between Goulburn, Canberra and Tarago.

- 85% percentile speeds were consistently under the road posted speed limits of 100 km/h. Speeds were comparatively lower at locations 3 and 4 as these included the uphill section of Bungendore Road south-west of Crisps Creek and Braidwood Road on the approach to the Tarago urban area.

- Heavy vehicle percentages were higher at location 1. This section of the road predominantly carries heavy vehicle traffic transporting waste between Crisps Creek IMF and the Eco Precinct.



Source: EMM (2022); VEOLIA (2022); DFSI (2017)

KEY
- Development footprint
- Key intersection
- Tube count location
- State road
- Regional road
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Main road
- Local road
- Track
- Watercourse

Road hierarchy, key intersections & tube count locations

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.13

creating opportunities

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i Existing traffic generation

Within the Eco Precinct, the MBT facility and the Bioreactor are approved to receive waste. Waste is transported either from the Crisps Creek IMF by road or from regional areas by road. The Eco Precinct is approved to receive up to 1,180,000 tpa of waste for transport to the Eco Precinct from Sydney by rail via the Crisps Creek IMF and is approved to receive up to 130,000 tpa of putrescible waste from the regional area by road (with written consent). The Eco Precinct is approved to receive up to a total of 120 trucks per day from the Crisps Creek IMF. The only other significant generator of heavy vehicle movements is the transport of cover material for use in the Bioreactor.

A summary of existing annual and daily heavy vehicle movements to the Eco Precinct is provided in Table 8.28.

Table 8.28 Summary of existing annual and daily heavy vehicle movements to the Eco Precinct

Origin	Annual			Average daily
	2018	**2019**	**2020**	
Crisps Creek IMF	24,824	24,401	23,215	97*
Other (including regional waste sources and Bioreactor daily cover)	10,231	15,872	16,980	46
Total	**35,055**	**40,273**	**40,195**	**143**

Notes: * A total of 120 daily trucks is approved from Crisps Creek IMF (URS 2010), with an hourly estimate of 21 trucks from the IMF to the Eco Precinct.

Waste is approved to be received at the Eco Precinct six days per week, however the majority of truck movements occur Monday to Friday. Therefore, average daily truck movements have been estimated using a five day week (250 days per year) which provides a conservative basis for existing daily trucks movements. The existing typical hourly profile distribution of incoming and outgoing heavy vehicles from Veolia's weighbridge data is presented in Figure 8.14. Approved haulage routes are shown in Figure 8.15.

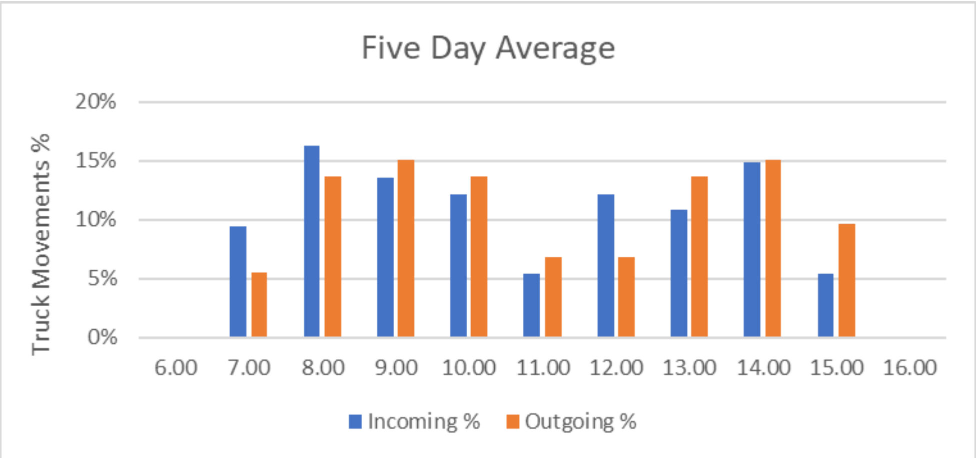


Figure 8.14 Weekday hourly profile of incoming and outgoing heavy vehicles

The Eco Precinct currently operates below approved limits. The approved peak hour heavy vehicle movements to the Eco Precinct are summarised in Table 8.29. During the peak AM and PM periods, there are an average of 30 heavy vehicle movements respectively. When factoring in the approved limits of the facility, there will typically be an increase of four heavy vehicles arriving in the peak hour (eight two-way movements). The Eco Precinct is approved to receive a total of 120 trucks per day from the Crisps Creek IMF.

Table 8.29 Peak hour heavy vehicle movements to the Eco Precinct

	Incoming AM	Outgoing AM	Incoming PM	Outgoing PM
Existing peak hour	16	14	15	15
Existing peak hour heavy vehicles from Crisps Creek IMF (average daily value of 97 trucks multiplied by peak hour percentages in the first row)	16	14	15	15
Approved peak hour heavy vehicles from Crisps Creek IMF (approved daily value of 120 trucks multiplied by peak hour percentages in the first row)	20	17	18	18
Maximum increase in peak hour movements to account for approved traffic movements from the Crisps Creek IMF	+4			

ii Haulage routes

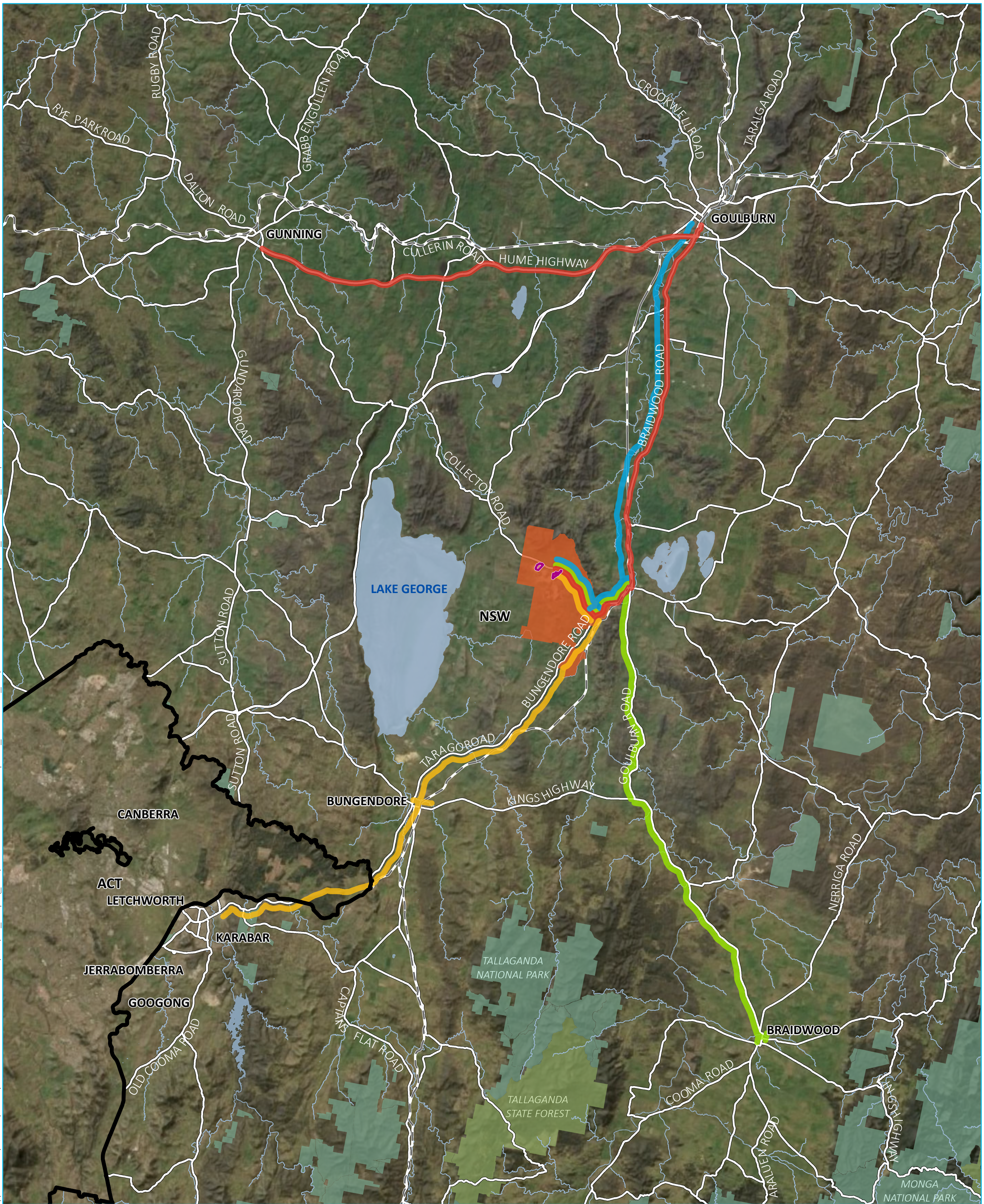
On average, 75% of the incoming trucks carry waste from the Crisps Creek IMF via Bungendore Road and Collector Road. The remaining 25% of trucks, which includes trucks transporting daily cover material for the Bioreactor, originate from various regions in NSW and arrive by the regional road network.

Other feedstock arrives by road transport travelling via four approved haulage routes which are presented in Figure 8.15. These routes include:

- via Tarago Road/Bungendore Road and Collector Road for deliveries from Australian Capital Territory (ACT), Queanbeyan and Palerang;
- via Kings Highway, Goulburn Road, Goulburn Street, Bungendore Road, and Collector Road for deliveries from Eurobodalla;
- via Braidwood Road, Goulburn Street, Bungendore Road, and Collector Road for deliveries from Upper Lachlan and Yass Valley; and
- via Hume Highway, Braidwood Road, Goulburn Street, Bungendore Road, and Collector Road for deliveries from Goulburn-Mulwaree.

iii Crash analysis

Between 2016 and 2020, there were 34 crashes on Braidwood Road and Bungendore Road (including at intersections) within Goulburn-Mulwaree LGA. The recorded crashes are illustrated in Figure 8.16. There were no crashes recorded on Collector Road. Most of the crashes occurred on undivided sections of two-way road and there was only one crash (moderate injury) recorded on the Bungendore Road route between Crisps Creek IMF and the Eco Precinct, which was north of the intersection with Collector Road.



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Source: EMM (2022); VEOLIA (2022); DFSI (2017)

0 10 20 km
GDA 1994 MGA Zone 55
N

KEY

- Development footprint
- Woodlawn Eco Precinct

Truck haulage routes

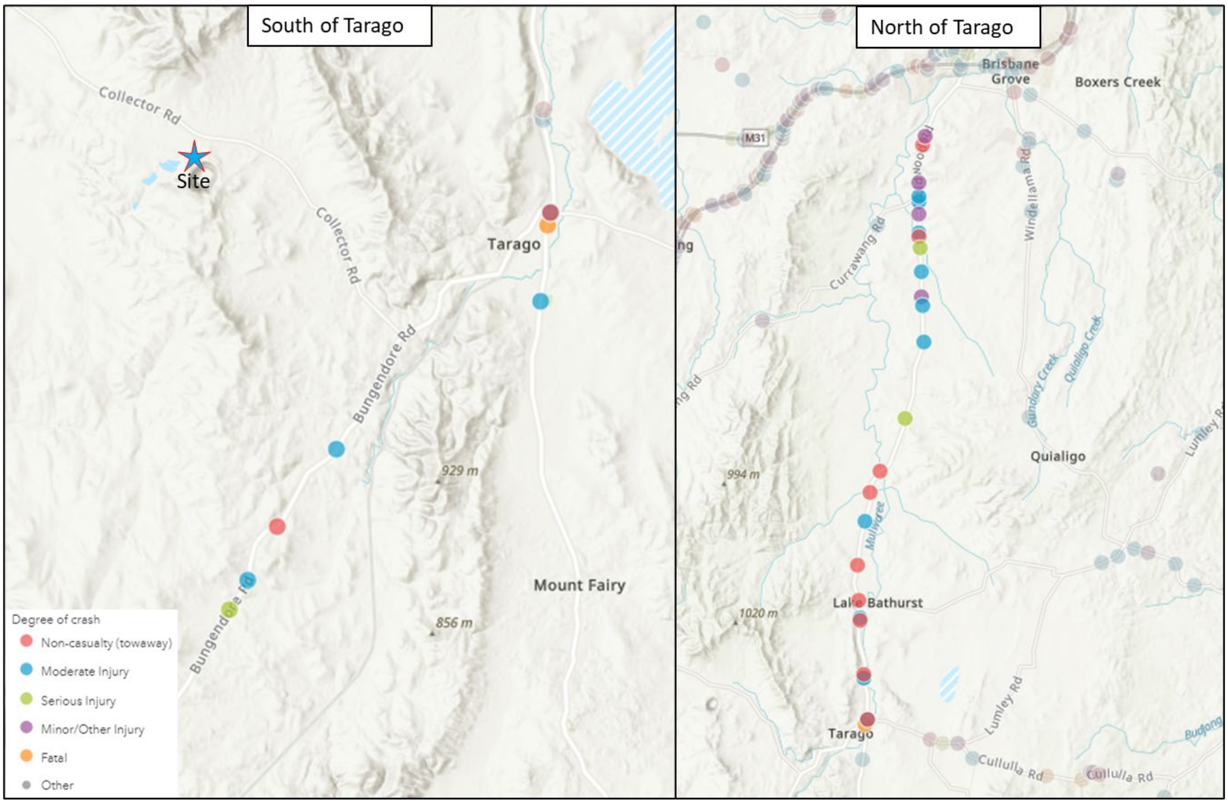
- ACT, Queanbeyan and Palerang
- Eurobodalla and Bega Way
- Goulburn- Mulwarree
- Upper Lachlan and Yass Valley

- Rail line
- Major road
- Watercourse
- NPWS reserve
- State forest
- State border

Approved haulage routes to the Eco Precinct

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.15

EMM
creating opportunities



Source: TfNSW Centre for Road Safety

Figure 8.16 Crash data between 2015 and 2019

iv Public and active transport

There are no public bus services running along Collector Road. School bus service S557 operates between Tarago and Braidwood schools via Braidwood Road and Kings Highway.

The closest train station is located in Tarago which is approximately 6 km from the main site entrance. The train service is not a viable mode of transport to the Eco Precinct.

There is currently no pedestrian or cycling infrastructure connected to the Eco Precinct due to the rural nature of the locality.

v Parking

There are two parking areas available at the Eco Precinct. The main car park has a capacity of approximately 75 parking spaces. The parking area towards the western side of the Eco Precinct serves the MBT and has a capacity of approximately 20 parking spaces.

8.5.3 Potential impacts

i Construction

a Construction traffic

Construction traffic would include the construction workforce and construction heavy vehicle movements. The majority of construction workers (275) are expected to commute in private mini-buses to the Eco Precinct. The peak daily and peak hourly construction traffic for the project is presented in Table 8.30. There may be periods during construction, where movements exceed the peak daily and/or hourly construction traffic numbers presented. However, these are likely to be 'one-off' events which will not be typically representative of the overall construction program.

Table 8.30 Peak daily and hourly construction traffic

Construction stage	Peak Daily		Peak Hourly	
	Trips	Movements	Trips	Movements
Light vehicles	25	50	25	50
Heavy vehicles	20	40	2	4
Buses	25	50	25	50
Total	**70**	**140**	**52**	**79**

Note: A 'vehicle trip' is defined as a vehicle entering the site once (1 movement) and a vehicle exiting the site once (1 movement).

The construction workforce is expected to be primarily sourced and accommodated in Goulburn and therefore would travel to/from the Eco Precinct from Goulburn. Construction heavy vehicles are assumed to arrive 50% from south of Bungendore/Collector Road intersection (from Canberra via Bungendore) and 50% from north (from Goulburn via Tarago). Over mass vehicles may be required to construct the project. Relevant permits from the National Heavy Vehicle Regulator will be acquired if needed.

b Intersection performance

The key intersections were modelled to assess how construction of the project would impact on network performance. The modelling provided key performance indicators, including level of service (LOS), which is a categorisation of the average delay in seconds encountered by all vehicles passing through the intersection. LOS A to C are good to satisfactory, D is nearing capacity, E is at capacity an F is unsatisfactory. LOS results are expressed in the form morning peak hour/afternoon peak hour, such as C/B.

When current baseline traffic volumes are combined with the proposed peak hour construction traffic, the following is noted:

- the Collector Road/ARC site access would operate at LOS A on all approaches and experience the longest delay (10.5 seconds) during the PM peak;
- the Bungendore Road/Collector Road intersection would continue to operate at LOS A on all approaches and experience the longest delay (13.3 seconds) during the AM peak; and
- the Braidwood Street/Wallace Street/Lumley Road would continue to operate at LOS B or better on all approaches and experience the longest delay (14.9 seconds) during the PM peak.

The Collector Road/existing site access intersection was not modelled because construction traffic is expected to use the new site access.

c Mid-block-capacity

A mid-block capacity analysis was undertaken for Collector Road and Bungendore Road during project construction. The analysis is based on a vehicle's average travel speed and is a measurement of traffic condition. The posted speed-limits for Collector Road and Bungendore Road are 100 km/h.

For mid-block capacity LOS A-C are good-satisfactory, D is nearing capacity, E is at capacity and F is unsatisfactory.

Collector Road presently operates at LOS A or B under existing conditions. During construction, the project will add to peak hour traffic and is expected to operate at LOS B or C. The percentage of heavy vehicles during the PM peak period is expected to notably increase to 42%, from 7% under existing conditions.

Bungendore Road presently operates at LOS D/C under existing conditions. During construction, the project will add to peak hour traffic and is expected to operate at LOS E/D. This indicates that the project construction may contribute to some additional delays during peak hour on some days during the construction period.

Upon completion of project construction work, the LOS for Collector Road and Bungendore Road will return to the existing traffic conditions.

ii Operation

The ARC is anticipated to process up to 380,000 tpa of residual waste feedstock. Table 8.31 presents the peak daily and hourly operational traffic trips associated with operation of the ARC. The feedstock will be within existing approved volumes that can be transported to the Eco Precinct, and hence this project does not propose any increase in approved waste volumes transported to the Eco Precinct for processing in the ARC. Heavy vehicles delivering waste feedstock from the Crisps Creek IMF in Table 8.31 are already part of the baseline traffic conditions, as these are approved traffic trips to the Eco Precinct from the IMF that would be diverted from the Bioreactor to the ARC. There will be other traffic movements associated with the project, including heavy vehicles for ongoing development of encapsulation cell, delivery of consumables (eg ammonia, hydrated lime and activated carbon), potential transport of IBAA material offsite (if approved for reuse), other incidental traffic movements (eg buses transporting visitors for site tours), and workforce light vehicles.

Table 8.31 Peak daily and hourly operational traffic

Traffic source	Peak Daily		Peak Hourly	
	Trips	Movements	Trips	Movements
Light vehicles	40	80	32	32[1]
Heavy vehicles delivering waste feedstock from the Crisps Creek IMF	50	100	8	16
Daily cover for the encapsulation cell	3	6	-	-
Delivery of consumables	5	10	1	2
Offsite transport of IBAA material	10	20	1	2
Buses	1	2	-	-
Total	**109**	**218**	**42**	**52**

Notes: 1. Movements are the same trips during the peak hour for light vehicles, as light vehicles comprise workers arriving at, or departing from the site, which would occur in two separate peak hours during the day.

Operation of the ARC will not adversely affect the existing road network traffic capacity along either Collector Road or Bungendore Road. Hence, no longer term traffic capacity related road improvements will be required due to operation of the ARC project.

The majority of the operational workforce (75%) is expected to primarily arrive from the east, by the ARC access road (from Tarago/Goulburn and Bungendore/Canberra). The remaining 25% of traffic is expected from the west (from Collector Road and other western areas). Movements associated with the construction of the encapsulation cell and the delivery of consumables is assumed to occur 100% to and from the east via Collector Road (50% from Goulburn and 50% from Canberra). During operation, all trucks transporting feedstock to the Eco Precinct will continue to use the approved haulage routes.

The project will include a car parking area of 60 parking spaces. A separate area is reserved for visitor bus drop-off.

a Intersection performance

Key intersections were modelled to assess how operation of the project would impact on network performance. When current baseline traffic volumes are combined with the proposed peak hour operational traffic, the following is noted:

- the Collector Road/existing site access would continue to operate at LOS A on all approaches and experience the longest delay (8.8 seconds) during the AM peak;
- the Collector Road/ARC site access would operate at LOS A on all approaches and experience the longest delay (10.5 seconds) during the PM peak;
- the Bungendore Road/Collector Road intersection would continue to operate at LOS A on all approaches and experience the longest delay (13.5 seconds) during the AM peak;
- the Braidwood Street/Wallace Street/Lumley Road would continue to operate at LOS A on all approaches and experience the longest delay (13.3 seconds) during the PM peak.

b Mid-block-capacity

A mid-block capacity analysis was undertaken for Collector Road and Bungendore Road during project operation.

Collector Road presently operates at LOS /A under existing conditions. During operation, the project will add to peak hour traffic, however the road would continue to operate at LOS B/A.

Bungendore Road presently operates at LOS D/C under existing conditions. During operation, the project will add to peak hour traffic, however the road would continue to operate at LOS D/C.

c ARC site access

The proposed ARC site access has been assessed in accordance with the *Austroads Guide to Road Design Part 4A (Unsignalised and Signalised Intersections)* (Austroads 2017a). The assessment finds that sight distances to the right and left would meet the minimum requirements as stipulated in the Austroads Guide to Road Design.

The need for additional intersection turn lanes (eg basic, auxiliary lane and channelised) was assessed in accordance with the current intersection design standards (Austroads 2017b) *Guide to Road Design Part 4, Intersections and Crossings General*. The assessment finds that under the peak hour traffic volumes during construction and operation scenarios, the proposed Type BAR and Type BAL intersection turn treatments will be sufficient as per the Austroads Warrant Chart requirement.

Truck queuing at the ARC was also analysed. The facility will be serviced by a new incoming weighbridge on the ARC access road. The typical service time per vehicle on the weighbridge for trucks bringing waste material will not exceed 1 minute and the truck arrival rate during the operation phase of the project will be 10 vehicles per hour. Required queue lengths were calculated in accordance with the *Austroads Guide to Traffic Management Part 2: Traffic Theory Concepts* (Austroads 2020). This analysis determined that the facility would require a maximum of 23 m queuing length from the weighbridge to the ARC access road intersection on Collector Road. The project would provide a distance of approximately 500 m between the proposed weighbridge and new site access which would be able to accommodate peak hour queuing.

d Bungendore Road climbing lane

It is recognised that the community has raised concerns about traffic delays on the hill climbing out of Crisps Creek IMF due to the slower moving heavy haulage vehicles transporting waste from the IMF to the Eco Precinct. The assessment indicates that during construction these delays are expected to increase slightly, with the peak hour LOS dropping from D/C to E/D. After the construction period this section of road should return to its current level of service at D/C.

The level of service during construction indicates that traffic flow is close to the limit of stable flow and is approaching an unstable flow situation where drivers may be restricted in their freedom to select their desired speeds and to manoeuvre within the traffic stream.

Veolia is undertaking a program of investigatory works on this section of road in discussion with Council.

8.5.4 Management measures

No material traffic impacts are expected during operation of the project. Accordingly, only construction mitigation measures have been proposed.

The management and mitigation measures are summarised in Table 8.32.

Table 8.32 Traffic and transport management and mitigation measures

Impact/risk	ID	Measure	Timing
Intersection compliance	TRA1	A new site access intersection is proposed for the ARC construction and operations access. The intersection will be constructed to 100 km/hr speed limit (110 km/hr design speed) Austroads standards and will incorporate Type BAR and Type BAL right and left turn treatments.	Pre-construction
Worksite traffic control	TRA2	A draft Construction Traffic Management Plan (CTMP) has been prepared and is included in the TIA in Appendix T. The CTMP will be updated by the construction contractor in consultation with GMC prior to commencement of construction.	Pre-construction
Traffic impacts to local community	TRA3	Regular notifications will be provided to the local community (local residents in Tarago and the surrounding areas) to advise of the current stage of the project construction work and associated daily and peak hourly construction traffic movements to allow local residents to be made aware of typical construction traffic movements throughout the project construction phase.	Construction

Table 8.32 Traffic and transport management and mitigation measures

Impact/risk	ID	Measure	Timing
Access by oversize or over mass vehicles	TRA4	Any requirements for oversize or over mass vehicles to deliver any specific construction components to the site will require the vehicle operator to obtain a permit (from NHVR). This access (if required) will be assessed and confirmed in the CTMP.	Pre-construction
Need for additional road width on Collector Road and Bungendore Road	TRA5	The proposed project construction traffic for the peak stage of construction will result in a reduction in the mid block capacity LOS on both these roads by one LOS category for the duration of the project peak construction stage. As this will be a short duration impact only, no additional road widening measures are recommended to be necessary to address this impact.	Construction

8.6 Groundwater

8.6.1 Introduction

A groundwater impact assessment (GWIA) has been prepared by EMM and is provided in Appendix U. The groundwater impact assessment was prepared with reference to relevant guidelines and policies, as outlined in Chapter 3 of the GWIA (Appendix U). The relevant SEARs and how they are addressed, are summarised in Appendix A and Section 1.2 of the GWIA (Appendix U). A summary of the existing environment, impact assessment and mitigation measures is provided below.

8.6.2 Existing environment

i Hydrogeology

Groundwater at the Eco Precinct is associated with the following geological units:

- a local, minor groundwater associated with the weathered rock and hillwash sediments and/or unconsolidated colluvial and alluvial sediments, and the extent of the local groundwater system is limited, owing to the distribution of colluvium/alluvium; and
- a deeper, regional groundwater within the fractured hard rock Ordovician and Silurian-Devonian aged volcanic, intrusive and sedimentary units, with groundwater primarily located in the rock fractures and joint spaces.

Both groundwater systems are limited resources owing to low porosity and permeability within the fractured rock units, and the limited extent of the clay rich colluvium. The geology underlying the evaporation dams comprises a sequence of alluvium/colluvium clay up to 20 m in thickness. The base of the clayey alluvium and the weathered bedrock forms an aquitard that separates the overlying colluvial/alluvial groundwater system from the fractured rock groundwater system.

The colluvial/alluvial/weathered bedrock groundwater system is considered unconfined, and the fractured rock groundwater system is considered semi-confined to confined based on measured groundwater elevations. Groundwater yields from the underlying hard rock rely on the interception of fractures.

It is considered that the colluvium/alluvium near Crisps Creek is hydraulically connected with groundwater migrating from the colluvial/alluvial system to the south in the vicinity of ED1. This watercourse is expected to act as a gaining stream during wet conditions, but could revert to a losing stream in dry conditions, if there is water or ponds along the watercourse (Earth2Water 2010). Allianoyonyiga Creek is also intermittent, with only the first 200 m of the watercourse overlying colluvium, and the remainder overlying the fractured rock, before it joins Willeroo Creek.

ii Water monitoring

Veolia conducts regular groundwater level and quality monitoring across the development footprint at 52 groundwater monitoring bores, of which 38 are monitored. Figure 8.17 shows the location of groundwater monitoring bores at the Eco Precinct. The average depth to groundwater within the shallow alluvium/colluvium is around 3 mbgl. The groundwater elevation in the fractured rock is deeper, at around 9 mbgl. This represents the pressure head of the confined/semi-confined system, not the depth to groundwater. Groundwater elevations in the alluvium/colluvium are comparable to long term rainfall trends. Groundwater levels in the fractured rock are mostly stable, with some increasing/decreasing trends associated with site operations or long term rainfall trends.

Prior land uses have impacted groundwater quality on a local scale (Golder 2021b). In general, groundwater from the fractured rock has a natural acidic to neutral pH, with a brackish salinity (approximately 3,000 microsiemens per centimetre (µS/cm)) and high concentrations of sulfate, copper, zinc and lead are common (AECOM 2017).

iii Water abstraction

Water supply to the Eco Precinct is via a groundwater borefield, referred to as the Willeroo borefield, located approximately 6 km west of the Eco Precinct near Lake George, shown in Figure 8.18. Existing water transfer pipelines transfer water from the borefield to the Eco Precinct. Veolia has a water access licence (WAL) for 600 ML (WAL: 28983) linked to four production bores (GW042931, GW042932, GW042933 and GW042934) and associated water supply works approvals. In the vicinity of the Willeroo borefield, the alluvial deposits are more extensive (especially in the palaeochannel areas) and comprise a shallow alluvial aquifer and a deeper alluvial aquifer. These sand and gravel zones are high permeability formations that provide useful supplies for small scale irrigation, mining, industrial, and stock and domestic uses.

iv Historic mining activities

Evaporation dams ED1, ED2 and ED3 were constructed in the late 1980s across a broad, shallow drainage gully in the north-west corner of the Eco Precinct to hold water from open cut and underground mining operations, and runoff from the waste rock dumps (AECOM 2017, Golder 2021b). The evaporation dams are still present and form part of the Eco Precinct water management system. They are currently used to store water associated with Woodlawn Mine's operations (primarily ED2) and as well as Veolia's integrated waste management operations (primarily ED2 and ED3 systems) (AECOM 2017, Golder 2021b).

AECOM (2017) reports that the water quality of the dams comprises acidic and high salinity water with elevated total metal concentrations due to the oxidisation of sulfide minerals. AECOM (2017) assessed the integrity of the dams and found seepage has occurred from both dams, traveling as far as 450 m from ED1 and 900 m from ED2 in the underlying colluvium/alluvium to the north and north-east and potentially at the surface of artesian bores immediately adjacent to the dams. Veolia manages this through regular monitoring and reporting to the EPA as part of existing EPL requirements.

v Other groundwater users

Groundwater abstraction and use is low from the fractured rock and does not occur from the colluvium/alluvium across the Eco Precinct. There are no registered groundwater users within 2 km of the development footprint, with the closest registered bore, 2.5 km to the south-west. There are 11 registered water bores within 2 km to the south and north of the Willeroo borefield (Figure 8.18). There are no high priority groundwater dependent ecosystems within the Eco Precinct area reported in either of the relevant water sharing plans (WSPs).

8.6.3 Potential impacts

i Construction

a Hydraulic loading from the encapsulation cell

The encapsulation cell proposed as part of the project is to be constructed in the south-west portion of the existing evaporation dam, ED1. Some seepage has been identified previously from ED1 and ED2, as described in Section 8.6.2. Historic artesian conditions have been observed around the perimeters of these dams, suspected to be caused by hydraulic loading from stored water in each of the dams (AECOM 2017).

The encapsulation cell has the potential to apply a load to the underlying sediments, which has the potential to consolidate the clayey sediment, causing the water pressure (groundwater level) to rise, and alter the local groundwater flow regime. A qualitative assessment was completed to consider this effect on groundwater and the potential impacts on receptors during construction.

The encapsulation cell will be progressively developed over the life of the project. During initial construction there is the potential for the shallow watertable in the unconfined colluvial aquifer to be intersected, although the base of the encapsulation cell is expected to be just above the watertable. These activities are expected to have minimal effect on the groundwater flow regime and therefore, should not impact any receptors.

b Inflows to the ARC bunker

An estimated 15 m deep waste bunker is proposed in the ARC precinct which will be excavated during construction. Groundwater within the fractured rock unit is expected to be intersected during the construction of the waste bunker. The weathered rock overlying the fractured rock is dry, with possible temporary storage of rainfall infiltration. The depth to water is 2 mbgl (noting that the measured groundwater level is considered to be the pressure level in the upper fractured rock system, not the watertable or depth to saturated rock).

In accordance with the NSW Aquifer Interference Policy, the volume of groundwater to be intercepted during construction has been estimated. An analytical solution has been used to calculate potential groundwater inflow rates to the ARC bunker during the construction phase, using available site data and realistic assumptions.

The total inflows to the bunker are estimated to be 0.7 ML, and assumes the excavation intersects fractures with a similar hydraulic conductivity to those tested on site. Application of a sensitivity analysis performed on the hydraulic conductivity of the lithology, shows the estimated range in total groundwater inflow during construction of the bunker is between 0.3–1.6 ML. This take is from the Lachlan Fold Belt Murray Darling Basin Groundwater Source, managed by the NSW Murray Darling Basin Fractured Rock Groundwater Sources WSP (2020). As the total take is less than 3 ML per year, entitlements for the groundwater that may be intercepted during excavation and construction of the ARC bunker are not required.

Source: EMM (2022); VEOLIA (2022); DFSI (2017)

0 1 2 km

GDA 1994 MGA Zone 55

N

Existing groundwater monitoring bores

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Major road
- Minor road
- Vehicular track
- Watercourse

Groundwater monitoring bore- sampled (formation)

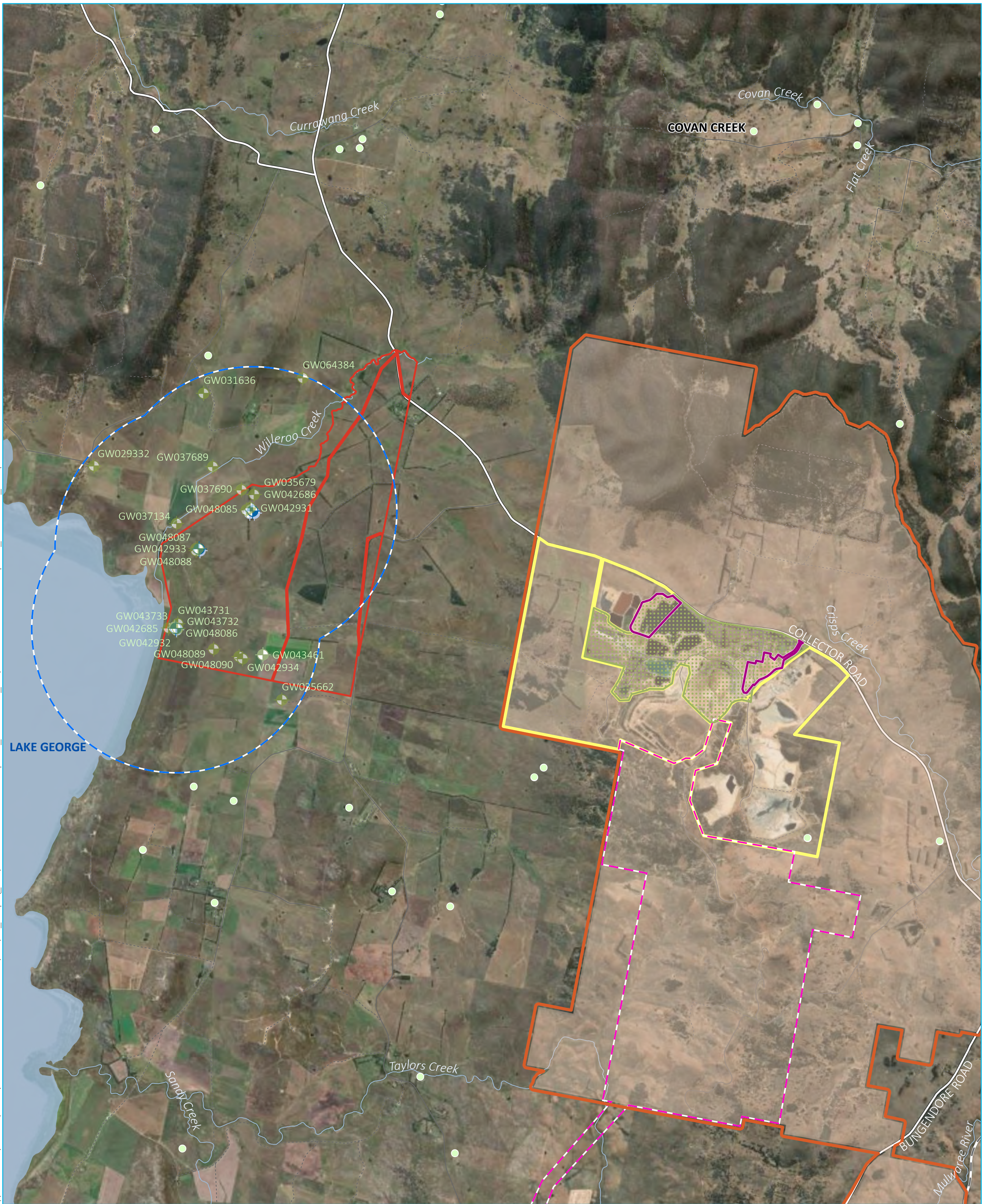
- Colluvium/alluvium
- Fractured rock
- Surface water
- Unknown

Groundwater monitoring bore- sampled (formation)

- Colluvium/alluvium
- Fractured rock
- Surface water
- Unknown

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.17

creating opportunities



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Source: EMM (2022); VEOLIA (2022); BOM (2021); DFSI (2017)

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Third-party bore
- Within 2 km Willeroo borefield
- Outside 2 km Willeroo borefield

Willeroo borefield
- Production bore
- Monitoring bore
- Willeroo borefield lot boundary
- Willeroo borefield 2 km buffer

Location of Willeroo Borefield and third party bores

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Environmental impact statement
Figure 8.18

creating opportunities

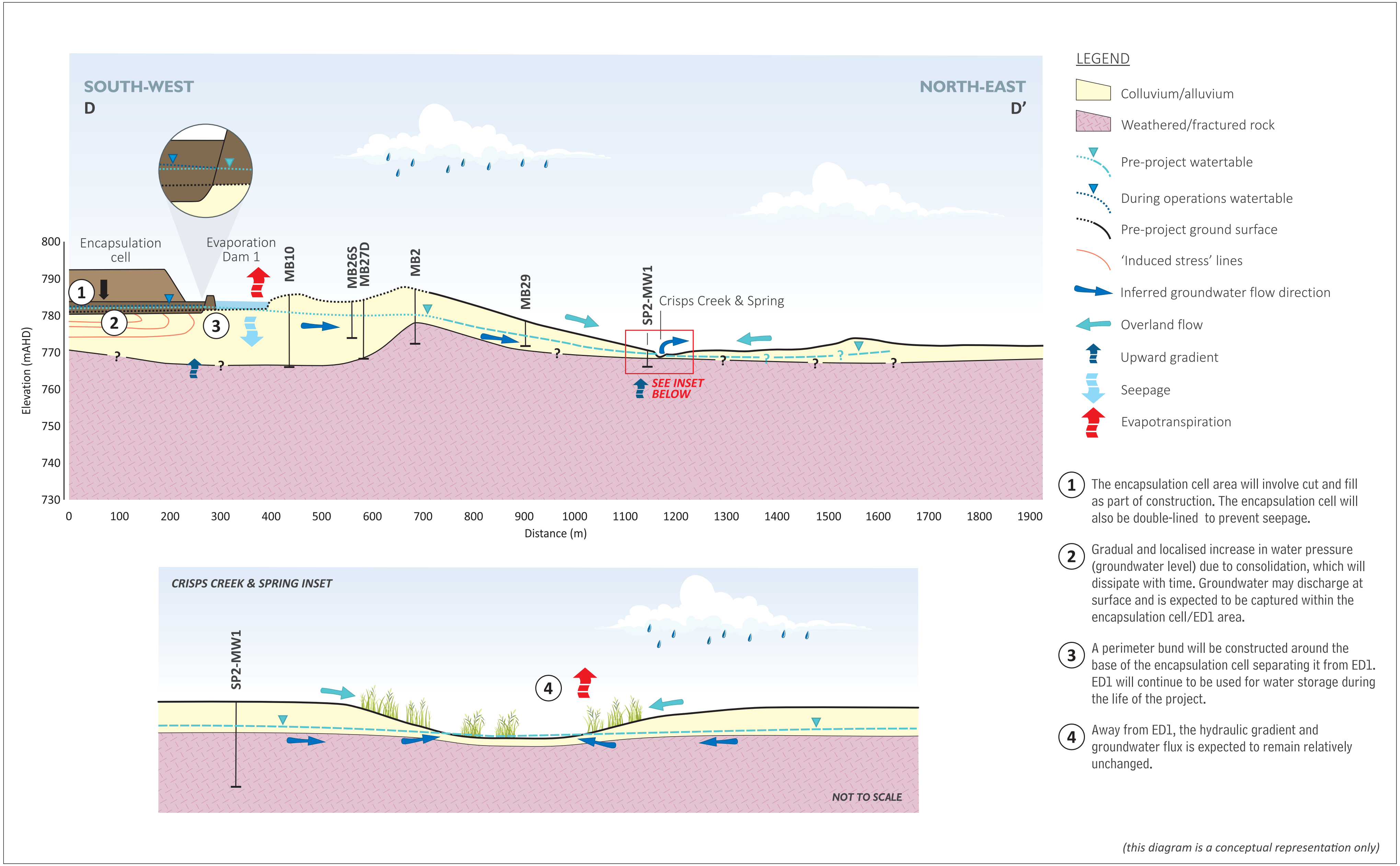
ii Operation

a Hydraulic loading from the encapsulation cell

As described above, the encapsulation cell has the potential to apply a load to the underlying sediments. A qualitative assessment was completed to consider this effect on groundwater and the potential impacts on receptors during operation as the encapsulation cell is progressively developed. Figure 8.19 and Figure 8.20 present conceptual diagrams depicting the assessment of hydraulic loading from the encapsulation cell during filling, and the end of filling, of the encapsulation cell.

During operation of and filling of the encapsulation cell, the following is expected:

- consolidation of the clayey sediments by up to approximately 0.5 m (total), which would occur gradually and consistent with the placement of the APCr over its design life of 25 years;
- gradual and localised increase in water pressure (groundwater level) in the colluvial/alluvial groundwater system in the immediate vicinity of ED1 due to consolidation, in areas where placement is occurring – the localised increase in water pressure would be temporary and would dissipate with time;
- possible discharge of the existing groundwater stored in the clayey sediments at surface, localised in the ED1 and/or encapsulation cell;
- dissipation of the increased water pressure (groundwater level) with time and distance from the encapsulation cell;
- minimal change to the hydraulic gradient of the watertable away from ED1, towards Crisps Creek;
- there may also be a measurable loading effect on the underlying semi-confined fractured rock groundwater system however the increase in water pressure is expected to be small, and hydraulic gradients are unlikely to substantially change; and
- groundwater flow processes are expected to remain relatively unchanged in the Crisps Creek and Spring 2 dam area, as this area will continue to receive water from rainfall and runoff (overland flow) and shallow groundwater discharge from the north.



Encapsulation cell hydraulic loading conceptual diagram – during operations

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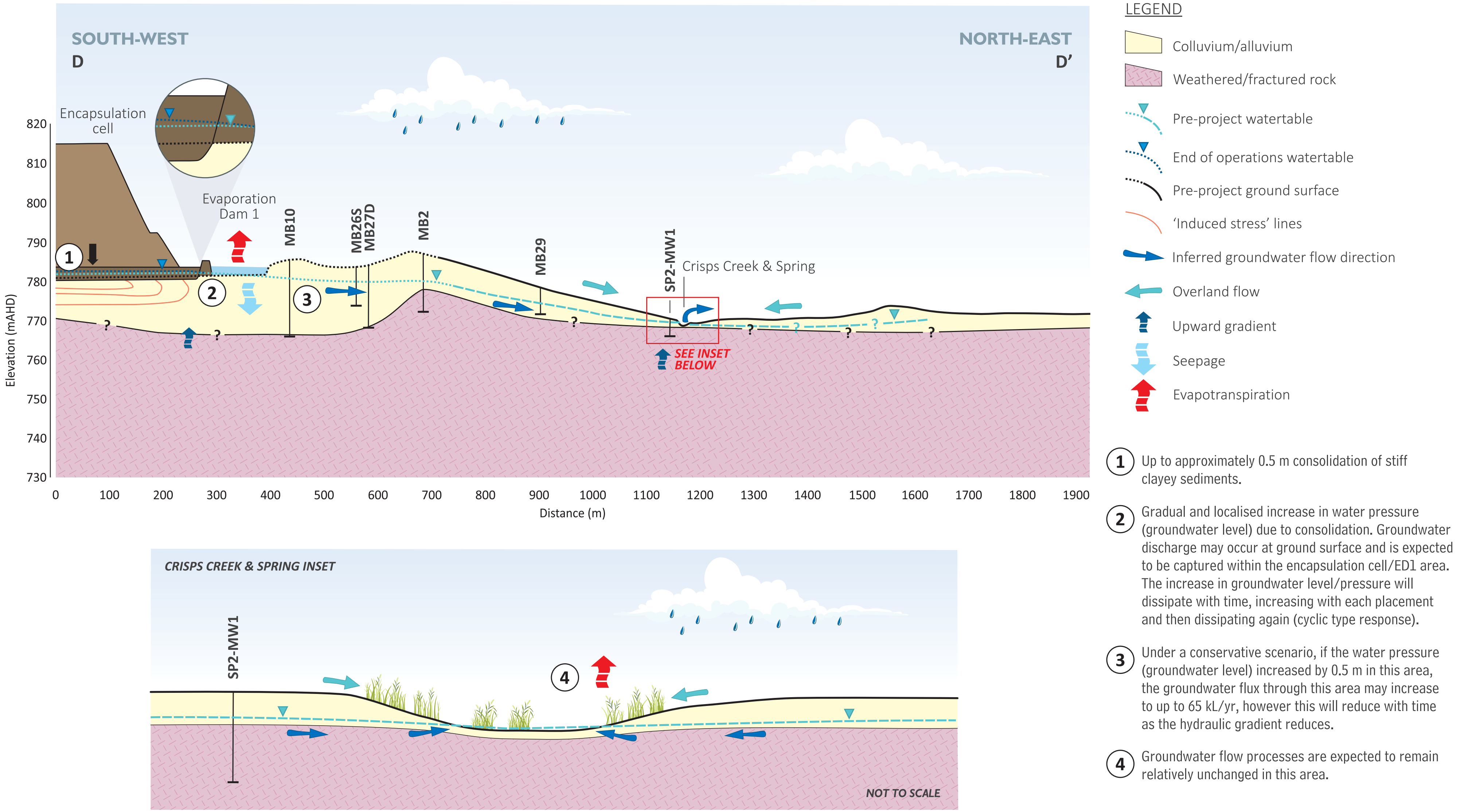
Environmental impact statement

Figure 8.19



1 Up to approximately 0.5 m consolidation of stiff clayey sediments.

2 Gradual and localised increase in water pressure (groundwater level) due to consolidation. Groundwater discharge may occur at ground surface and is expected to be captured within the encapsulation cell/ED1 area. The increase in groundwater level/pressure will dissipate with time, increasing with each placement and then dissipating again (cyclic type response).

3 Under a conservative scenario, if the water pressure (groundwater level) increased by 0.5 m in this area, the groundwater flux through this area may increase to up to 65 kL/yr, however this will reduce with time as the hydraulic gradient reduces.

4 Groundwater flow processes are expected to remain relatively unchanged in this area.

(this diagram is a conceptual representation only)

Encapsulation cell hydraulic loading conceptual diagram – end of operations

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Environmental impact statement
Figure 8.20

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b Groundwater abstraction from Willeroo

The project and existing water demand is a combined total of approximately 140 ML/yr in normal seasons and potentially up to 300 ML/yr in drought seasons. This maximum demand equates to about 0.8 ML/day of groundwater supply from the Willeroo borefield.

A preliminary analytical groundwater model was developed to simulate the operation of the bores and estimate the associated drawdown at individual production bores and across the borefield area. The analytical modelling was based on the aquifer parameters derived from a constant rate pumping test (refer to Appendix U). The model conservatively assumes that the maximum borefield entitlement of 600 ML/yr is extracted from the deep aquifer for the duration of the project. This highly conservative approach equates to a continuous abstraction rate of 20 L/s from the borefield.

The preliminary analytical model suggests the Willeroo borefield is capable of continuously supplying 20 L/s with limited drawdown and stress to the shallow and deep alluvial aquifers. The maximum simulated drawdown at each of the production bores after 12 months operation is 6 m or less. The simulated heads in the pumped aquifer show spatially limited drawdown in the vicinity of the production bores compared to the pre-pumping conditions. The predicted drawdown following 25 years of cyclic operation of the borefield is shown in Figure 8.21. Drawdown after 25 years of operation is not expected to result in impacts at third party bores, the closest of which is 750 m from the borefield.

iii Cumulative impacts

The closest water affecting activity that has the potential to contribute to cumulative impacts on groundwater assets is the Woodlawn Mine operation. While currently in care and maintenance, should mining resume, the planned underground mine workings will be located approximately 150 m laterally offset from the encapsulation cell and approximately 500 mbgl. Mining operations (historical or future) would result in groundwater drawdown within the hard rock/fractured rock groundwater system, which is already depressed due to the open cut mine void (the Bioreactor). However, due to the low permeability of the geology, the drawdown is localised.

Cumulative impacts are not assessed further, as the potential impacts of the project on the water environment and associated assets are considered negligible to minor and, in the vicinity of approved mining operations, are associated with the shallow alluvial/colluvial groundwater system.

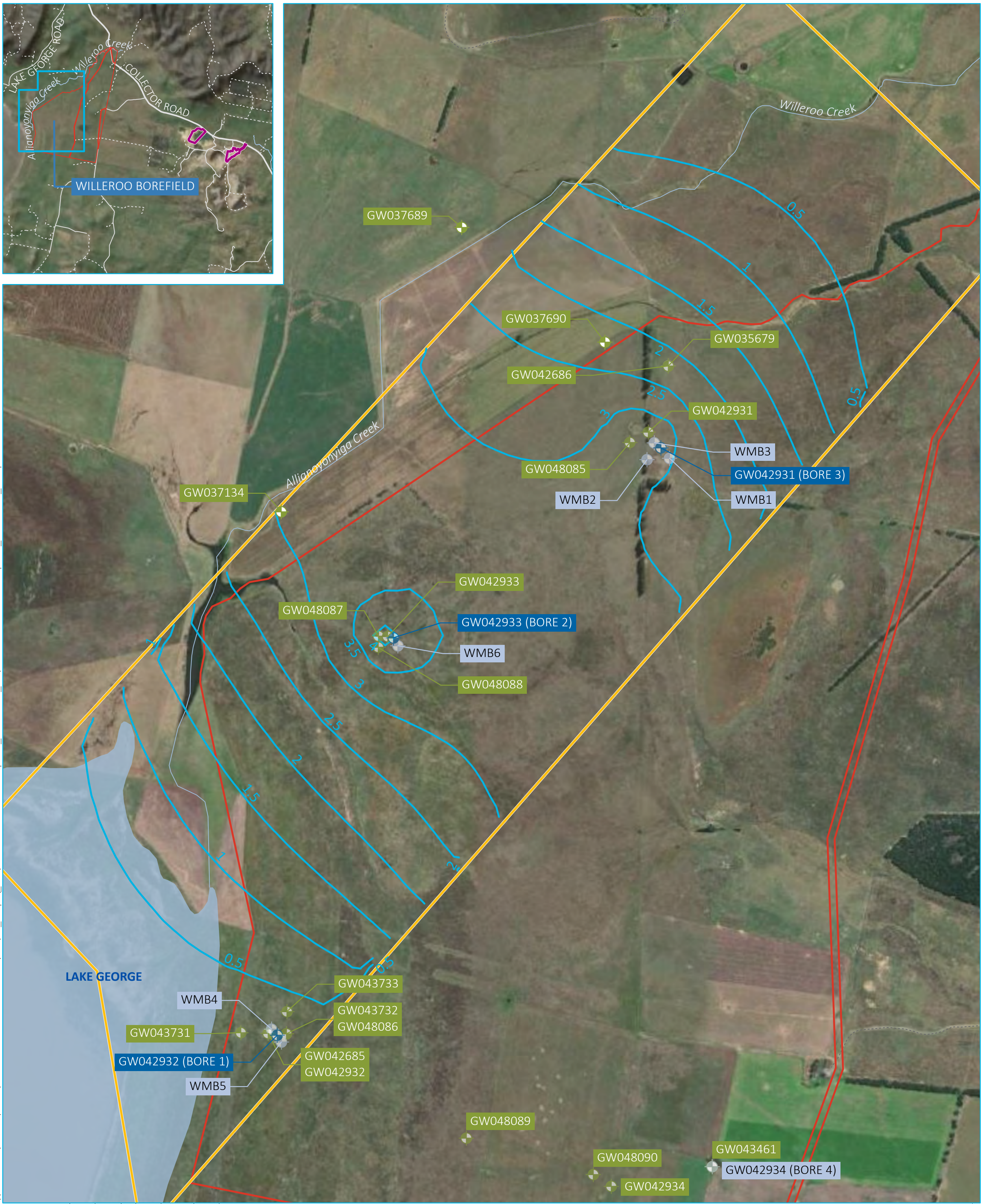
iv Groundwater licensing

Veolia is required to licence water that is taken in accordance with the WM Act or where incidental water is intercepted as described under the NSW Aquifer Interference Policy. Veolia is required to hold WALs in each affected water source to account for all water extracted and intercepted.

As previously described, Veolia has adequate allocations (WAL: 28983) licensed under the NSW Murray Darling Basin Fractured Rock Groundwater Sources Water Sharing Plan (WSP 2020) (specifically the Lachlan Fold Belt Murray Darling Basin Groundwater Source).

The project is estimated to require up to 90 ML/yr for the proposed ARC, depending on climate conditions. Therefore, Veolia holds sufficient groundwater licence volume to cater for site demands, even during severe drought periods.

Veolia is exempt from requiring entitlements for the groundwater that may be intercepted during excavation and construction of the ARC bunker as it is predicted to be less than 3 ML per year.



Source: EMM (2022); Veolia (2022); DFSI (2017)

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KEY

- Development footprint
- Production bore
- Monitoring bore
- Third-party bore
- Groundwater contour (m)
- Model boundary
- Willeroo borefield lot boundary
- Vehicular track
- Watercourse
- Named waterbody

Simulated groundwater drawdown after 25 years of operation

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Environmental impact statement
Figure 8.21

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8.6.4 Management measures

Table 8.33 lists the potential impacts to groundwater receptors from water affecting activities and the proposed management measures.

Table 8.33 Groundwater management and mitigation measures

Potential impact	ID	Measure	Timing
Drawdown greater than predicted (ie greater than 2 m) at third party bores	GW1	Make good arrangements, such as: • provision of supplementary water to offset loss in water supply; • provision of a new submersible pump to sustain a lost yield; • lowering pumping infrastructure within the bore to increase available drawdown; or • drilling a new bore for the landowner.	Operation
Drawdown greater than predicted (ie greater than 2 m) at third party bores	GW2	Incorporate groundwater monitoring in the Willeroo borefield area into the overall water monitoring and management program, either through the use of existing monitoring bores and/or installation of additional monitoring bores.	Pre-construction
Hydraulic loading in ED 1 causing seepage at a faster rate	GW3	Conduct hydraulic loading analysis and review of requirements for groundwater seepage interception system, as part of detailed design of the encapsulation cell.	Post-approval, pre-construction
Hydraulic loading in ED 1 causing seepage at a faster rate	GW4	Review and update of the water monitoring program ensuring adequate monitoring for potential: • surface expression of seepage; and • groundwater discharge and/or increase groundwater pressure/level greater than that inferred in this groundwater assessment. Install additional groundwater monitoring bores (nested) down gradient of the ED1 area, towards Crisps Creek. Develop site specific trigger levels, aligned with the environmental and cultural values, including WaterNSW Sydney Drinking Water Catchment requirements.	Post-approval, pre-construction
Hydraulic loading in ED 1 causing seepage at a faster rate	GW5	Develop trigger action response plan that includes contingency measures, if required, such as: • seepage management system, including seepage interception trench, sump and bores.	Consideration post-approval, as part of detailed design. Pre-construction.
Generation of acid mine drainage from rock stockpiles	GW6	The design and management of the stockpiles to ensure PAF materials are exposed for short periods of time before being encapsulated with compacted NAF material. Stockpiles will be covered with uncontaminated topsoil and lime (or other alkaline materials) will be added to prevent the formation of acid mine drainage.	Construction

Table 8.33 Groundwater management and mitigation measures

Potential impact	ID	Measure	Timing
Seepage of APCr leachate from the leachate evaporation dam, encapsulation cell and/or the IBA maturation pad	GW7	The encapsulation cell and leachate ponds will be fully lined, with a leachate barrier and leak detection system. The IBA maturation pad will comprise a hard-stand base, and a leachate collection system. Groundwater monitoring bores will be used as an early indication of seepage. Ongoing site inspection will be undertaken to verify there are no breaches of the leakage management system. Any ongoing risks will be assessed as part of closure planning to determine site closure remediation strategies and (if required) monitoring bores.	Construction and operation
Seepage from water storages (PCD and stormwater pond)	GW8	Water storage areas will be lined to limit loss of water. The dams will be routinely monitored for surface expression of seepage, including existing bores in the PCD area not currently monitored.	Construction and operation
Runoff from areas within the project development (including roads, plant, other buildings and hazard goods storage areas) picking up contaminant solutes and entering the groundwater system	GW9	The project development will include runoff containment systems and other features to restrict surface water runoff within the project disturbance area. Where possible runoff from clean water areas will be captured and re-used. There will be dedicated and bunded storage areas for fuel and reagents.	Construction and operation

Application of the management measures outlined is expected to reduce the potential groundwater impact risks of the project to predominantly low, though medium risk remains for increased groundwater discharge and local water quality impacts, particularly to Crisps Creek. Implementation of a Water Management Plan (WMP) and water monitoring are proposed to manage this residual risk.

The existing WMP will be updated for the project, encompassing both the construction phase and the operational phase of the project. The WMP will document the proposed mitigation and management measures for the approved project, and will include the surface and groundwater monitoring program, reporting requirements, spill management and response, site specific trigger levels, trigger action response plan (corrective actions), contingencies, and responsibilities for all management measures. The WMP will be prepared in consultation with DPE Water, the Natural Resources Access Regulator (NRAR) and EPA and will consider concerns raised during the exhibition and approvals process for the project. The WMP will include details of the surface water and groundwater monitoring program, which will incorporate the existing monitoring network and any identified updates, monitoring frequencies and water quality constituents.

Monitoring of the existing groundwater monitoring network will continue, and the network will be expanded to identify potential impacts from project activities. This will provide an early indication of potential impact to sensitive receptors, including Crisps Creek. Triggers and thresholds will be developed to provide context on if, how and when management measures are required as part of the WMP for the project.

8.7 Surface water

8.7.1 Introduction

A surface water impact assessment (SWIA) has been prepared by EMM and is provided in Appendix V. The SWIA was prepared with reference to relevant guidelines and policies, as outlined in Chapter 3 of the SWIA. The relevant SEARs and how they are addressed, are summarised in Appendix A and Section 1.2 of the SWIA (Appendix V). A summary of the existing environment, impact assessment and mitigation measures is provided in this section.

8.7.2 Existing environment

i Existing watercourses

The Eco Precinct is located on the Great Dividing Range. The western and southern portions of the Eco Precinct drain to the west through several small watercourses that flow into Lake George. The northern and eastern portions of the Eco Precinct are within the Crisps Creek catchment. Crisps Creek is a tributary to the Mulwaree River. Its headwaters are primarily located within the Eco Precinct. The ARC and encapsulation cell development footprints are within the Crisps Creek catchment. Hence, Crisps Creek is the only receiving watercourse described for the purposes of assessing impacts to surface water. Figure 8.22 shows the alignment of Crisps Creek and its tributaries relative to the Eco Precinct and the development footprint. There are no watercourses within the development footprint.

Crisps Creek is located on the northern side of Collector Road, north of the development footprint, and flows generally to the south-east within the Eco Precinct. Downstream of the Eco Precinct it flows in an easterly direction for approximately 4.5 km before joining the Mulwaree River, upstream of Tarago. The Mulwaree River is a major tributary of the Wollondilly River, which ultimately flows into Lake Burragorang (also known as Warragamba Dam). Lake Burragorang is a major water supply dam for the Sydney metropolitan region and is managed by WaterNSW.

In the vicinity of the development footprint, Crisps Creek is an unregulated watercourse that has a variable streamflow regime. The creek is characterised by an intermittent channel that has a variable width and depth. The channel (where present) meanders through a floodplain that is between 50 to 150 m wide. The ARC and encapsulation cell areas are more than 10 m higher than the adjoining Crisps Creek floodplain levels and are therefore not affected by Crisps Creek flooding.

ii Existing water management system

The development footprint is within Veolia's integrated waste management operations in areas that form part of the existing water management system at the Eco Precinct. Runoff from existing disturbed areas within the development footprints are captured in the Eco Precinct's water management system, and do not enter Crisps Creek.

The Eco Precinct's existing water management system comprises several runoff capture dams, pumped reticulation systems, a leachate treatment plant and several evaporation dams. The overall water management system comprises the following primary components, which are operated independently:

- ED1 system – receives direct rainfall, runoff from the surrounding area, a catchment area to the west of the Bioreactor and water pumped from the Waste Rock Dam and PCD. Water accumulation is managed via natural and assisted evaporation from ED1. The ARC development footprint is within PCD catchment. During wet periods, captured water in the PCD is pumped to ED1 to prevent the overflow of the PCD. The encapsulation cell development footprint is within ED1.

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Special (Crown & Private Lands) Lease 20
- Sampling location
- Major road
- Minor road
- Vehicular track
- Contour (10 m interval m AHD)
- Watercourse
- Named waterbody

Surface water features and monitoring locations

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Environmental impact statement
Figure 8.22

0 0.5 1 km
GDA 1994 MGA Zone 55

Source: EMM (2022); Veolia (2022); DFSI (2017); GA (2011)

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- Evaporation dam 3 south system (ED3S system) – receives direct rainfall, runoff from the surrounding area and runoff captured in the Bioreactor void. Water accumulation is managed via natural evaporation from ED3S.
- Leachate management system – manages leachate that is pumped from the Bioreactor void. Leachate is initially treated in the Leachate Treatment Plant and dam. Evaporation dams are used to manage the accumulation of treated leachate via natural and assisted evaporation.
- ED2 system – ED2 is part of the Woodlawn Mine operation (and operated separate to Veolia's integrated waste management operations).

Veolia operates the system to manage:

- separated leachate and surface water runoff from the Bioreactor (managed within the ED3S system and leachate management system);
- surplus water from the Waste Rock Dam, which receives seepage from waste rock dumps from historical mining located to the south of the Bioreactor (which is pumped to ED1); and
- surplus water that accumulates in the PCD (which is pumped to ED1). The PCD catchment area includes most of the ARC development footprint as well as areas to the north and north-east of the Bioreactor.

The potential impacts of the project on the operational effectiveness of ED1 due to construction and operation of the encapsulation cell within ED1, and construction of the ARC within the PCD catchment, and other aspects of the project have been assessed. The project will not interact with, or impact the operational effectiveness of the ED2 or ED3S systems, or the leachate management system.

8.7.3 Potential impacts

Potential impacts on natural surface water features and the existing water management system (primarily the ED1 system) at the Eco Precinct have been assessed.

A water management system will be developed for the project to manage stormwater runoff during construction and operations, supply water to the project and manage contaminated water streams and wastewater (ie sewage). The proposed water management approach is described in Chapter 4. The project's water management system will be integrated with parts of the Eco Precinct's water management system, which may evolve over time for a variety of reasons such as completion of rehabilitation works.

A summary of the water management approach during construction and operation, and potential impacts, is presented in the following sections.

i Construction

The ARC development footprint is predominantly within PCD catchment, except for a small portion of the northern end of the ARC access road. The ARC development footprint will remain within the overall catchment of PCD, however the ARC development will have its own catchment and water management system.

Construction of the ARC is anticipated to take approximately three years. A construction water management system will be established within the ARC development footprint to:

- provide water for construction;
- manage water produced by construction activities; and
- manage surface water runoff from areas disturbed by construction.

The construction phase water management system is described separately for the areas that are upstream and downstream of the PCD catchment. The northern portion of the ARC access road will be constructed downstream of the PCD catchment in an area that drains to Crisps Creek. Construction activities in this area will include earthworks and the construction of the road, the intersection with Collector Road and the road drainage system. Surface water runoff from the area disturbed by construction will be managed in accordance with the methods recommended in *Managing Urban Stormwater: Volume 1* (Landcom 2004).

The majority of the ARC development footprint will be constructed within the PCD catchment. All surface water runoff and any water produced by construction activities will be managed in the PCD and ED1 system. No off-site discharges are expected. As there will be no change to the PCD catchment area and negligible change (relative to existing conditions) to the volume of water draining to PCD during the construction phase of the ARC, no impacts to the operational effectiveness of ED1 are expected during construction.

The encapsulation cell will be staged progressively over the project’s 25 year design life. Surface water runoff and leachate management during both the construction and post construction periods is described in the Encapsulation cell reference design report (Appendix F).

During construction, water will be required for dust suppression, concrete production, earthworks and other uses. Water will be supplied by the Eco Precinct’s existing water supply system, which sources water from surface water storages and the Willeroo Borefield. The existing water entitlements for abstraction from the Willeroo borefield held by Veolia will be adequate to meet water demand during the construction phase of the project (which will be less than the demand for operation of the project).

ii Operation

Surface water management within the ARC development footprint will comprise three separate systems: stormwater, process water and wastewater. These systems will manage water to avoid impacts to offsite watercourses and receivers. The water management system and catchment areas for the ARC development footprint are shown in Figure 8.23 and described in Table 8.34.

Table 8.34 Operational water management system for the ARC development footprint

System	Description	Discharges to
Stormwater management system	**Access road stormwater system:** the access road has been aligned to avoid direct impacts to the ephemeral wetland. This catchment area will be approximately 1.1 ha. Stormwater runoff from the access road will be managed in vegetated swales that will be constructed on either side of the road. The swales will receive runoff from the road pavement, road reserve and any upgradient undisturbed catchment area that drains towards the road. The swales will infiltrate some runoff. Surplus runoff will drain to a location that is near the inlet to the existing Collector Road culvert. No changes to the catchment area to this culvert or the culvert structure are proposed. Stormwater discharge from the swales is expected to have water quality characteristics that are similar to most regional roads (such as Collector Road), which drain to roadside swales. Impacts to the ephemeral wetland will be minimised by avoiding direct impacts to the wetland and having the swales discharge near the Collector Road culvert inlet.	Crisps Creek catchment, upstream of the Collector Road culvert.
	ARC stormwater system: will manage runoff from a 9.8 ha area that includes the ARC building, ARC substation, internal roads, hardstand and parking areas and landscaping. During the initial operating period, the stormwater system will overflow to the PCD (which is pumped to ED1). However, the system will be developed such that it can be integrated into a future stormwater system in the PCD catchment, that overflows to the receiving environment. Accordingly, the following water management objectives apply to the ARC stormwater system. Controls will include: • Source controls to minimise stormwater contamination risks. • Stormwater controls including rainwater tanks, vegetated swales and gross pollutant traps. • Stormwater harvesting system that captures stormwater runoff for use in the process water system. Overflows from the ARC stormwater system are expected to occur approximately once per year, during significant rainfall events or following periods of prolonged wet weather. When overflows do occur, the water quality is expected to be similar to treated stormwater runoff from an industrial area that has a stormwater system consistent with industry best practice. This will be achieved as the proposed source controls will separate potentially contaminated water from stormwater runoff and the water quality controls and stormwater harvesting will reduce pollutant loads in stormwater overflows.	The ARC stormwater system will overflow to the PCD but may be integrated into a future stormwater system in the PCD catchment that overflows to the Crisps Creek catchment.
	IBA area stormwater system: will manage runoff from the IBA area (approximately 2.2 ha) which is assumed to be potentially contaminated. All runoff from the IBA area will be conveyed to the IBA Pond via surface drains. Water captured in the IBA Pond will be used within the IBA area for dust suppression. If required, surplus water from the IBA Pond can be dewatered to ED1 to avoid overflows (only expected to be required to restore basin capacity if a significant rainfall event or a prolonged period of above average rainfall occurs). Controls will include: • Drainage to be established to divert runoff from any upgradient areas around the IBA area. • Drainage systems will have a 1% AEP capacity to ensure there is no stormwater ingress into the IBA area stormwater system. • The IBA Pond will have capacity to capture all runoff during a 1% AEP event and water accumulation in the pond will primarily be used with in the IBA area for dust suppression (or dewatered to ED1). No overflows from the IBA area stormwater system are expected.	Zero-discharge system

Table 8.34 Operational water management system for the ARC development footprint

System	Description	Discharges to
Process water system	A process water system will be established to meet operational water requirements which will include steam generation, steam conditioning, ash quenching, APCr stabilisation, operation of the flue gas treatment system, dust suppression within the IBA area and other miscellaneous uses. The process water system will utilise potentially contaminated stormwater runoff captured in the IBA area stormwater system and recycled process water (which could comprise a mixture of raw water, brine and return water from the wash down and steam cycle systems). Under certain circumstances (such as extended wet weather) there may be surplus process water, which will be managed via dewatering to ED1, which will ensure that all contaminated stormwater or recycled process water is managed in either the process water system or ED1, with no discharges to the stormwater system.	Zero-discharge system
Wastewater system	Wastewater (ie sewage) will be generated by amenities within the ARC building. An on-site wastewater system will be established to manage wastewater produced within the ARC building. The system will be designed and operated in accordance with the methods described in *Designing and Installing On-Site Wastewater Systems* (WaterNSW 2019). The wastewater system will comprise: • an aerated wastewater treatment system with disinfection (or an equivalent system); and • a sub-surface drip irrigation system to manage the treated effluent. The proposed effluent irrigation area is shown in Figure 8.23 and Table 8.23.	Effluent irrigation area within the ARC development footprint.

Operation of the ARC will require a water supply of approximately 245 kL/day (90 ML/year). Water will be sourced from:

- stormwater harvesting (when available); and
- groundwater abstraction from the Willeroo Borefield (when stormwater is not available). During drought conditions, the Willeroo Borefield will meet the project's full water supply requirements for extended periods of time as required. Existing pipeline infrastructure from the Willeroo borefield to the Eco Precinct will be used to transport abstracted groundwater from Willeroo Borefield to the ARC as described in Chapter 4.

The encapsulation cell development footprint is wholly within the footprint of ED1. The encapsulation cell will be a lined and engineered landfill cell for the encapsulation of APCr. It will be constructed in the western portion of ED1 in a staged manner over the 25 year project design life. During operation, surface water runoff and leachate will be generated:

- Surface water runoff will be generated from completed portions of the encapsulation cell, which will be progressively capped. The water quality of runoff is expected to be clean but will drain to ED1, due to the encapsulation cell's location within ED1.
- Leachate will be generated within the encapsulation cell. An engineered leachate barrier and collection system will be installed which will be double lined on the floor and walls. The upper liner will provide leachate collection and the lower layer will be used for leak detection. Collected leachate will be pumped to a leachate evaporation pond that will be located within the development footprint, indicatively to the north of the encapsulation cell. The leachate evaporation pond will be lined and will not receive any inflows other than leachate from the encapsulation cell, and direct rainfall, and will manage leachate accumulation via evaporation.

The construction of encapsulation cell and leachate evaporation pond will reduce both the evaporation area and storage capacity of ED1. The SWIA (Appendix V) includes an assessment of the storage capacity for existing and future scenarios in ED1. The assessment determined that the project will reduce the capacity of ED1 to manage pumped inflows. An ED1 water balance has been prepared (Appendix V) to assess the cumulative impact of the project on the operational effectiveness of ED1. The water balance model results demonstrate that the project will not impact the operational effectiveness of ED1, in that it can still receive pumped inflows (from the PCD and Waste Rock Dam) for a full range of weather conditions. No impacts to ED1 water quality are expected as the encapsulation cell will have a full base liner with a leachate collection system and the leachate pond will be fully lined with the pond embankment crest constructed above the ED1 Maximum Water Level.

iii Residual impacts

Three water management objectives have been established to enable a clear and concise assessment of the project's residual impacts. The three objectives and how they will be achieved by the project are described below:

- Objective 1 – achieve a neutral or beneficial effect (NorBE) on the operational effectiveness of ED1. Water balance modelling of the ED1 system has demonstrated that a NorBE can be achieved. The project will result in the following changes to the existing ED1 water balance:

    - The encapsulation cell will be constructed in the western portion of ED1. This will reduce the storage volume and evaporation area of ED1, reducing its operational effectiveness.

    - Surplus process water may be dewatered to ED1. This will utilise some of the storage and evaporation capacity, reducing the capacity available to manage pumped inflows from the PCD and Waste Rock Dam.

    - Stormwater harvesting will be incorporated into the proposed ARC and IBA area stormwater systems. This will reduce (relative to existing conditions) the runoff volume to the PCD. The lower runoff volumes to PCD will reduce the storage and evaporation capacity required in ED1 to manage pumped inflows from the PCD, thereby increasing the available capacity in the dam.

  Water balance modelling of the ED1 system has demonstrated that a NorBE can be achieved.

- Objective 2 – achieve a NorBE on receiving water quality - the water management system will be developed to have a NorBE on receiving water quality. Consistency with this objective is demonstrated by establishing best practice and MUSIC water quality modelling to address WaterNSW's NorBE assessment criteria. This can be achieved by a water management system that:

    - separates potentially contaminated water from stormwater runoff;

    - includes a stormwater management system that is consistent with industry best practice (also referred to as current recommended practices) for an industrial area; and

    - includes a wastewater (ie sewage) management system that is designed and operated in accordance with the methods described in Designing and Installing On-Site Wastewater Systems (WaterNSW 2019).

  Consistency with this objective is demonstrated by establishing best practice and MUSIC water quality modelling to address WaterNSW's NorBE assessment criteria.

KEY
- Development footprint
- Veolia integrated waste management operations
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Proposed stormwater catchment
- Collector road culvert
- ARC building footprint
- Site layout detail
- Major road
- Minor road
- Vehicular track
- Watercourse
- Contour (5 m interval m AHD)
- Ephemeral wetland

Site layout
- ARC building
- ARC substation
- Existing dam
- IBA area
- IBA conveyor
- IBA maturation structure
- IBA processing building
- Landscaping
- Plant collection dam (PCD)
- Road/carpark
- Stormwater pond
- Waste water irrigation
- Encapsulation cell
- Leachate management pond

Proposed water management infrastructure

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.23

EMM
creating opportunities

Source: EMM (2022); Veolia (2022); DFSI (2017); GA (2011)

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- Objective 3 – provide a drought-secure water supply for the project. The operation of the project will require an ongoing water supply of approximately 245 kL/day or 90 ML/year. This water will be sourced from stormwater harvesting (when available) and the Willeroo Borefield (when stormwater is not available). During drought conditions, it is anticipated that the Willeroo Borefield will meet the project's full water supply requirements for extended periods of time.

  The project will achieve a NorBE on operational effectiveness of the existing water management system and water quality, and has a demonstrated drought-secure water supply for the project.

8.7.4 Management measures

Table 8.35 lists the potential impacts to surface water and the proposed management measures. Management and monitoring plans will be prepared post approval in accordance with consent conditions.

Table 8.35 Surface water management and mitigation measures

Potential impact	ID	Measure	Timing
Impacts to water quality during construction	SW1	Construction water management plan. This plan will: • provide and erosion and sediment control plan for construction of the access road (which is outside of the PCD catchment); • describe how water will be managed to achieve compliance with consent and EPL conditions; and • establish surface water quantity and quality monitoring requirements.	Construction
Impacts to water quality during operation	SW2	Operational water management plan. This plan will: • describe how water will be managed to achieve compliance with consent and EPL conditions; and • establish surface water quantity and quality monitoring requirements. The operational water management plan may be integrated with the existing water management plan for the Eco Precinct. Additional management plans will be required for the encapsulation cell.	Operation
Stormwater measures – source controls	SW3	• All waste will be handled within the ARC building, which is a fully enclosed structure. • Energy recovery by-products (IBA and APCr) will be initially handled within the ARC building before being transported to the IBA area and encapsulation cell using methods that do not pose a stormwater contamination risk. • All hazardous chemicals and hydrocarbon products will be stored in bunded areas in accordance with relevant Australian Standard AS1940:2004 and other relevant guidelines. • All washdown water will be managed by the process water system. • All pervious areas will be vegetated to minimise soil erosion.	Operation

Table 8.35 Surface water management and mitigation measures

Potential impact	ID	Measure	Timing
Stormwater management – Stormwater conveyance and flooding	SW4	• Stormwater runoff will be managed via a combination of surface and piped drainage systems. These systems will be designed to have a non-erosive hydraulic capacity equivalent to the 5% AEP event. • Overland flow paths will be established to have a 1% AEP capacity. • The stormwater system and overall ARC will be designed to prevent stormwater ingress into the ARC building for the 1% AEP event.	Operation
Fire water retention and containment	SW5	• The ARC Pond will be designed to contain any firewater runoff and leaks and spills that may occur within the ARC stormwater system. The Design achieves this objective as the maximum firewater volume was established to be approximately one-third of the ARC Pond volume.	Operation
Access road stormwater system (discharges to Crisps Creek catchment, upstream of the Collector Road culvert)	SW6	• All runoff will be treated in vegetated roadside swales.	Operation
ARC stormwater system (overflows to the PCD catchment)	SW7	• Source controls to minimise stormwater contamination risks. • Various stormwater controls including rainwater tanks, vegetated swales and gross pollutant traps. • Stormwater harvesting system that captures stormwater runoff for use in the process water system. It is noted that the system established by the Design has a capacity that is approximately three times greater than the capacity required to capture the 5 day 90th percentile rainfall event.	Operation
IBA area stormwater system (zero discharges)	SW8	• A stormwater capture and harvesting system that has capacity to capture all runoff during a 1% AEP event.	Operation

8.8 Contamination

8.8.1 Introduction

A preliminary site investigation (PSI) has been prepared by Golder Associates Pty Ltd (Golder) to assess the presence of contamination resulting from current and former land uses and potential implications for the project. The PSI is provided in Appendix W and is summarised in this section.

The SEARs require a site contamination assessment in accordance with relevant EPA guidelines. The contamination assessment has been completed in accordance relevant guidance from:

- *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, New South Wales Environment Protection Authority (EPA 2017);
- *Consultants Reporting on Contaminated Land*, New South Wales Environment Protection Authority (EPA 2020);

- *National Environment Protection (Assessment of Site Contamination) Measure 1999*, National Environment Protection Council (NEPC 2013); and
- *Managing Land Contamination Planning Guidelines, SEPP 55 – Remediation of Land*. Department of Urban Affairs and Planning & Environment Protection Authority (DUAP & EPA 1998).

The PSI includes a desktop review of previous assessments relating to contamination, a site inspection by contaminated land specialists with Veolia site personnel, and a limited program of soil sampling from a series of test pits and geotechnical boreholes. The results are discussed in Section 8.8.3.

8.8.2 Existing environment

i Geology

The Eco Precinct is located within the Lachlan Fold Belt on the Great Dividing Range. The bedrock consists of complex sequences of volcanic and low-grade metamorphic rocks of Ordovician and Silurian-Devonian age.

Based on available information, the following subsurface conditions may occur:

- fill/topsoil, associated with the existing earthwork activities;
- natural/residual soil, with a variable thickness;
- interbedded sandstone, siltstone, claystone and shale; and
- dolerite and dolerite sills, however this can be sporadic.

ii Hydrogeology

The Great Dividing Range roughly bisects the Eco Precinct with the westward flowing streams entering Lake George, located approximately 8 km to the west. East-flowing streams join Crisps Creek and the Mulwaree River east of the Eco Precinct.

Regional groundwater is broadly divided into basement Ordovician and Silurian-Devonian aged volcanics, intrusive sedimentary rocks and overlying fluvial and hill wash sequences. Man-made structures such as the tailings and evaporation ponds within the Eco Precinct have been identified as having localised influence on the local groundwater regime.

Inferred groundwater flow at the ARC development footprint is anticipated to be in a north-east direction, intersecting Crisps Creek and flowing east to south-east. The bedrock aquifer inferred groundwater flow is to the south/south-west toward the Bioreactor.

iii Existing contamination

Land at the Eco Precinct has been highly disturbed by historical mining operations, Veolia's integrated waste management operations commenced in 2004, and the adjoining Woodlawn Mine recommenced in 2015. Two primary investigations into contamination at the ARC development footprint have been undertaken previously:

- Phase 1 environmental site assessment (Golder 2007) – the area of investigation was divided into Area 1 and Area 2; and
- Detailed site investigation (Golder 2009).

These investigations report that the ARC development footprint has included land uses activities associated with mining and waste management operations since the 1970s, including:

- mine plant and processing area;
- tailings management;
- stockpiling of fill and other materials;
- process water ponds;
- underground and above-ground storage tanks including for hydrocarbons; and
- water management infrastructure, including the plant collection dam which was historically constructed as part of mining operations and received spillage from the mine plant area. The plant collection dam is still present and continues to operate as part of the Eco Precinct's water management system.

Potential sources of contamination identified included:

- dredge material potentially contaminated with heavy metals stored on primary crusher pad;
- acid mine drainage based on observations of discoloured water ponded in the footprint;
- spills/leaks of waste oil;
- spills/leaks of diesel from former tanks;
- friable asbestos sheeting identified in demolition waste from former buildings;
- residual ore concentrates to be present in soils;
- runoff from former mine plant area potentially impacted by high metal and sulfide concentrations and low pH;
- high silver concentrations from tailings material stockpiled in the area; and
- water and sediment in several ponds potentially containing high metal concentrations and low pH.

Activities have resulted in varied levels of excavation and deposition of fill materials across the ARC development footprint. A range of contaminants of concern associated with historic uses have been identified including heavy metals and hydrocarbons.

A site inspection undertaken on 21 June 2021 as part of the contamination assessment identified significant changes to this area compared to previous contamination investigations. Excavation depths have notably increased across the development footprint ranging from 0.6–3 m. Existing building slabs and foundations previously present have been modified and stockpiles have been removed and relocated. The ARC development footprint is currently being used for material storage. Concrete slabs and some remnant structures from the previous site uses remain.

Results of the soil sampling within the ARC development footprint undertaken as part of the PSI (Appendix W) indicate that, with the exception of lead, soil concentrations for metals are below the respective site adopted assessment criteria. Lead concentrations exceed the nominated NEPM (2013) HIL of 1,500 mg/kg for commercial/industrial land use, particularly at sampling locations identified as fill sources. While the results exceed the adopted HIL in the majority of samples analysed, they are generally lower than the previous investigation undertaken in 2009, except for samples taken from an area identified as the 'Tipper Stockpile'.

Previous investigations have identified seepage from evaporation dams ED1 and ED2, which has caused localised impacts to groundwater. The encapsulation cell is within the footprint of ED1, which was constructed in the late 1980s. Three evaporation dams, ED1, ED2 and ED3, excavated to the north-west of the open pit around the same time, received contaminated water from mining operations. These dams operate as part of the water management system at the Eco Precinct and are approved to receive water from both Veolia's operations and the Woodlawn Mine. Water within ED1 contains elevated metal concentrations and has a low pH.

Table 8.36 provides a breakdown of monitoring results near the ARC development footprint (sampling results from 2008) and the encapsulation cell (sampling results from 2017). The results for cadmium, copper, lead, and zinc generally exceed the current ANZG 2018 water quality guidelines for freshwater (95% species protection) in wells where detections are present.

Table 8.36 Summary of groundwater results from monitoring wells near the ARC development footprint

Location	Well ID	Date sampled	Electrical conductivity (µS/cm)	Cadmium (mg/L)	Copper (mg/L)	Lead (mg/L)	Zinc (mg/L)
ANZG 2018 guideline criterion	-	-	-	0.0002	0.0014	0.0034	0.008
ARC development footprint	MW05	01/09/2008	3,060	0.0011	0.001	<0.001	0.034
	MW06	01/09/2008	9,270	0.0012	0.005	0.001	0.03
	MW07	01/09/2008	3,500	0.0013	0.004	0.008	0.064
Encapsulation cell development footprint	MB30	12/01/2017	5,431	<0.0001	<0.001	<0.001	<0.005
		31/01/2017	511	0.00038	0.008	<0.0002	0.039
	MB31	12/01/2017	15.75	0.0002	<0.001	<0.001	0.006
		31/01/2017	0.45	0.00031	0.011	<0.0002	0.036

Further groundwater monitoring as part of EPL requirements in 2020 for Veolia's existing groundwater monitoring network recorded results that exceeded the current ANZG 2018 water quality guidelines for freshwater (95% species protection) for cadmium, copper, lead and zinc in wells where detections were present.

8.8.3 Potential impacts

The primary source of contamination within the ARC development and encapsulation cell development footprints is heavy metals related to past mining activities. In addition to metals impact, there is potential for acid formation through the oxidation of pyrite, and pyrrhotite. Contaminants of concern within the development footprint of the Project are largely associated with heavy metals from mining activities undertaken at the site from 1978 to 1998. As metal contamination is non-volatile and risks to site users in a commercial/industrial setting has been assessed as low (Golder, 2009b), on-site containment of the impacted material is considered appropriate as it is a preferred management strategy under the NEPM (NEPC, 2013) and is identified in ANZECC (1999) as an appropriate form of management of non-volatile contaminants.

The rehabilitation of areas impacted by former mining activities within the development footprint are required under the existing Eco Precinct consents (DA 31-02-99 and MP10_0012, as modified). Condition 22 of DA 31-02-99 and Condition 29 of MP10_0012 refer to the need for a Rehabilitation Management Plan as part of the Landfill Environmental Management Plan. Veolia's *Landfill Closure and Rehabilitation Management Plan* (Veolia 2016) addresses these requirements.

A remedial strategy is being prepared for the ARC development footprint based on previous site contamination and monitoring investigations and will define environmental and technically justifiable remedial methods, such as a 'cap and contain' approach, to remove and encapsulate impacted material. The implementation of the remedial strategy will occur under the existing Eco Precinct consents (DA 31-02-99 and MP10_0012, as modified) and will be implemented prior to construction of the project. The following approach will be adopted by Veolia in accordance with the recommended general process for assessment of site contamination (Schedule A of the NEPM (NEPC, 2013)) to ensure the ARC development footprint is suitable (or can be made suitable), for the project:

- Prepare a Sampling and Analysis Quality Plan to inform a detailed site investigation (DSI) in the ARC development footprint.
- Complete a DSI in the ARC development footprint to:
  - delineate known metals impacts within the ARC development footprint;
  - conduct additional groundwater monitoring to understand the likely volume and rate of groundwater inflow to areas of deeper excavation for the ARC building during construction;
  - obtain additional information on the acid generating potential of the fill and residual material to ensure appropriate design of foundations and structures;
  - obtain information on the leachability of fill material proposed to be used as part of the development and the potential for mobilisation of metal impacts to ensure appropriate management and material handling measures can be implemented; and
  - further assess the material in the Tipper Stockpile or other fill sources with high lead concentrations to confirm the suitability of this material.
- Prepare a Remedial Action Plan (RAP) for the proposed ARC development footprint based on the outcomes of the DSI to provide a framework for appropriate removal or management of remnant contamination that poses an unacceptable risk to the proposed development.
- Obtain a Site Audit Statement from a NSW EPA accredited Site Auditor including a statement of site suitability certifying that the investigation and remediation of the proposed ARC development footprint has been completed in accordance with relevant environmental legislation and guidelines prior to the development commencing.

The above approach will be implemented prior to construction of the project under the provision of the existing consents (DA 31-02-99 and MP10_0012, as modified).

The encapsulation cell development footprint will be suitable in its current state for the intended land use, subject to the design controls being implemented as described in Appendix F, and implementation of an unexpected finds protocol during construction and operation. The encapsulation cell will have a double composite liner including primary and secondary geomembranes and geosynthetic clay liners. Once constructed, the base of the encapsulation cell would act as a barrier to prevent surface infiltration of, and physical contact exposure with residual impacts, if any, below the cell. Construction environmental management requirements for the encapsulation cell will include an unexpected finds protocol to address the potential exposure of suspected impacted material during construction and operation.

The Landfill Closure and Rehabilitation Management Plan will be updated to reflect the proposed rehabilitation activities within the development footprint for the project.

8.8.4 Management measures

A PSI has been prepared in respect of the project and in accordance with relevant documents, guidelines and legislation including the RH SEPP (Appendix W). The PSI concludes that land within the proposed development footprint is either suitable in its current state for the project, or will be suitable after any remediation or development controls are in place, and where applicable, after the implementation of the RAP including obtaining a Site Audit Statement.

The management and mitigation measures are summarised in Table 8.37.

Table 8.37 Contamination management and mitigation measures

Potential impact	ID	Measure	Timing
Disturbance of existing contamination	CON1	A remedial strategy will be implemented for the ARC development footprint prior to construction under the existing consents (DA 31-02-99 and MP10_0012, as modified). This will include implementation of a RAP and obtaining a Site Audit Statement prior to construction.	Pre-construction
Disturbance of existing contamination	CON2	During construction, residual risks from contaminated material that remains at the development footprint (for example, material that has been capped beneath the ground surface in accordance with a remedial strategy), will be managed via a construction environmental management plan to manage interactions between the project any remaining contamination. This will include an unexpected finds protocol.	Construction
Disturbance of existing contamination	CON3	The Landfill Closure and Rehabilitation Management Plan will be updated to reflect the proposed rehabilitation activities within the development footprint for the project. This will include documenting the presence of contaminated materials below hard stand or capped surfaces, detailing procedures for future ground disturbance works that minimise the potential for harm to human health and the environment.	Operation

8.9 Bushfire

8.9.1 Introduction

A bushfire protection assessment (BFPA) has been prepared by Travers Bushfire & Ecology and is provided in Appendix X. The BFPA was prepared in accordance with the *NSW Rural Fire Service (NSW RFS) Planning for Bush Fire Protection* (PBP 2019) planning policy document (hereafter referred to as 'PBP'). The relevant SEARs and how they are addressed, are summarised in Appendix A. A summary of the existing environment, impact assessment and mitigation measures are provided below.

The overall aims and objectives of the NSW RFS PBP 2019 include:

- afford the buildings and their occupants protection from exposure to bush fire;
- provide for a defendable space to be located around buildings;
- provide appropriate separation between a hazard and buildings which, in combination with other measures, minimise material ignition;
- ensure that appropriate operational access and egress for emergency services personnel and residents is available;

- provide for ongoing management and maintenance of bush fire protection measures; and
- ensure that utility services are adequate to meet the needs of firefighters.

The aims of the BFPA are to:

- review the bushfire threat to the landscape;
- undertake a bushfire attack assessment in accordance with PBP;
- propose a suitable package of bushfire protection measures commensurate with the level of risk to the development; and
- assess the degree to which the proposed bushfire protection measures meet the aim and objectives of PBP and any relevant performance criteria.

8.9.2 Existing environment

i Regional fire weather

An analysis of the fire weather experienced in the region provides insight into potential bushfire behaviour within the project and surrounds. Forest Fire Danger Index (FFDI) is based upon the LGA and Fire Weather District, as determined by the NSW RFS, where the development is to be located. The FFDI measures the degree of danger of fire in Australian vegetation and assumes a credible worst case scenario and an absence of any other mitigating factors relating to aspect or prevailing wind. The 1:50 year fire weather scenario for most of NSW is determined as FFDI 80, however, a number of areas including the Greater Sydney, Greater Hunter, Illawarra, Far South Coast and Southern Ranges Fire Areas have higher FFDIs which are set at 100. An FFDI of 100 has been used to inform bushfire behaviour on land within the development footprint (Southern Ranges Fire Weather Area). The project is within the Southern Tablelands Bush Fire Management Committee (BFMC) area, which comprises the following regional weather characteristics:

- warm to hot summers, with top temperatures of 35–37°C;
- cool winters with temperature lows of -5°C;
- rainfall varies considerably, with some areas experiencing average rainfall of approximately 800 mm to 1000 mm per year, whereas other areas experience a lower average annual rainfall (eg 600 mm in the north of the Upper Lachlan Shire towards the Abercrombie River);
- generally, it can be stated that rainfall is both unreliable and at its lowest during summer months, resulting in substantial curing of pastoral and grazing land which covers a large proportion of the area; and
- the bushfire season generally runs from October to March/April (Southern Tablelands BFMC 2019).

Prevailing weather conditions associated with the bushfire season in the Southern Tablelands BFMC area are north/north westerly winds, although in late afternoons southerly and easterly winds may occur for short periods. Lightning strikes during storms occur frequently in the bushfire season (Southern Tablelands BFMC 2019).

ii History of bushfire and exiting ignition sources

The Southern Tablelands BFMC area has on average 265 bushfires per year, of which five could be considered to be large fires.

Major fires occur sporadically with about three in a five year period. Generally, Goulburn/Mulwaree has a history of major fires occurring in a cycle of five to seven years (Southern Tablelands BFMC 2019).

The main sources of ignition in the Southern Tablelands BFMC area are:

- lightning strikes associated with late spring and summer thunderstorm activities;
- fugitive embers or escapes from legal and illegal burn off in rural areas;
- human error (ignition from farm machinery, mowers, welding, camp fires and careless disposal of cigarette butts); and
- arson activity in urban areas and around rubbish tips.

iii Vegetation assessment

Vegetation fuel is one of the key factors (with weather and topography), which influences how a fire behaves. Fuel attributes vary between different vegetation groups, by type, quantity, arrangement and moisture content. Based on these attributes, fuels will also vary in how they ignite, spread and their intensity. Grouping vegetation types with similar fuel attributes provides a means to generally characterise fire behaviour potential.

The project is partially mapped as bushfire prone (Vegetation Category 3 and buffer) on the Council Bush Fire Prone Land Map (Figure 8.24). Vegetation Category 3 is considered to be medium bushfire risk vegetation and includes grasslands, freshwater wetland, semi-arid woodland alpine complex and arid shrublands (NSW RFS 2015).

Vegetation within 140 m of the development footprint was assessed to determine its formation and classification. Vegetation mapping within the development footprint has been undertaken as part of the BDAR for the project (Appendix Y).

Mapped vegetation within 140 m of the proposed building footprint includes grassy woodland (Plant Community Type 1191) and a combination of vegetated and non-vegetated areas identified on the Bush Fire Prone Land Map as Category 3 Vegetation, assumed to be grassland. The project also includes a stormwater retention dam, a stormwater settling pond, a plant collection dam and other landscaped areas which, if unmanaged, could potentially contribute to the bushfire hazard.

iv Slope assessment

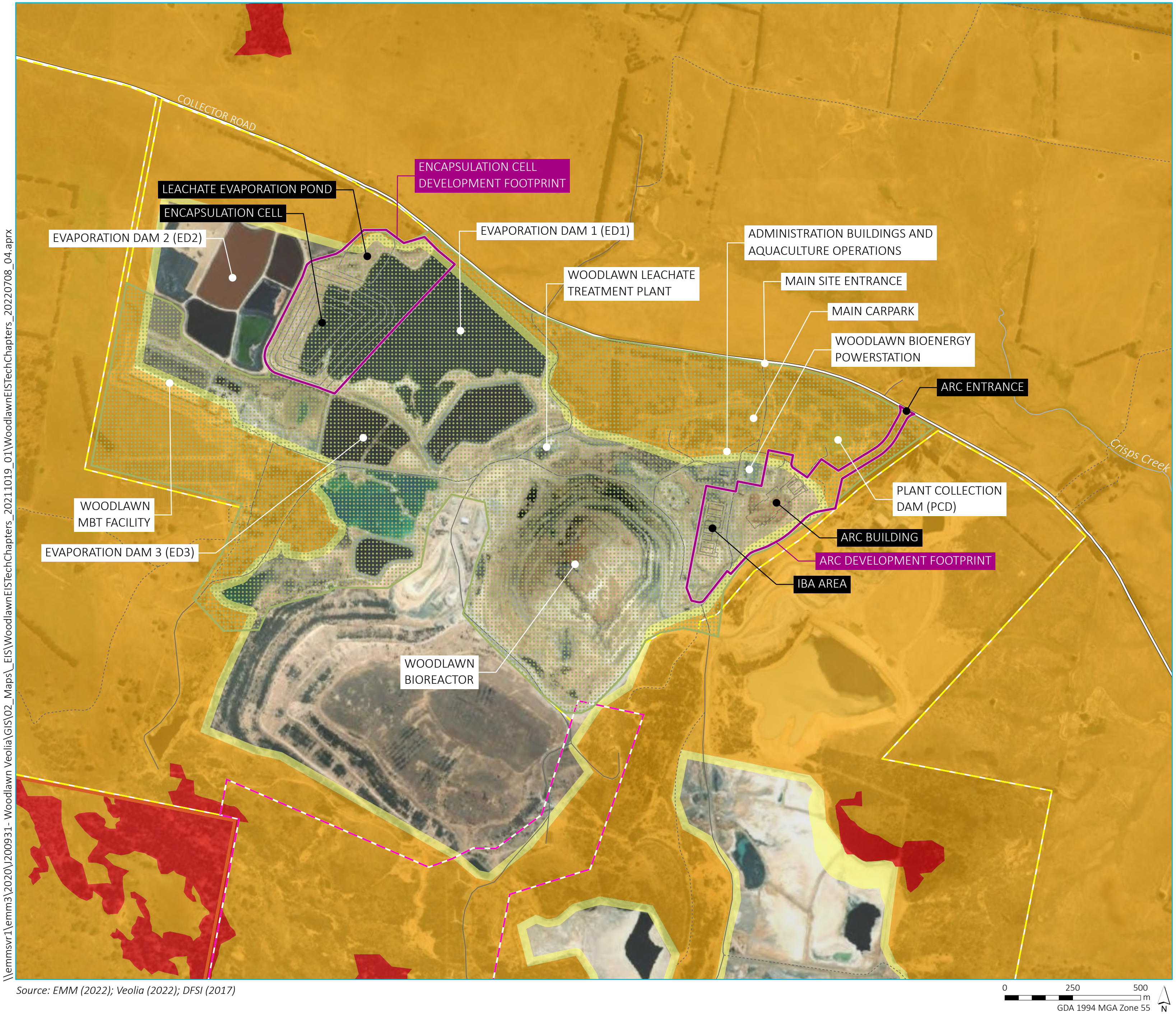
Effective slope is considered to be the slope under the vegetation, which will most significantly influence bushfire behaviours for each aspect, and is usually the steepest slope.

The effective slope (post earthworks) has been assessed for up to 100 m from the project's development footprint. This allows understanding of the slope classifications under the vegetation hazard and therefore potential fire behaviour surrounding the project. Slope immediately adjacent to the project is a combination of flat land/upslope and 0–5° downslope.

8.9.3 Potential impacts

While bushfires occur naturally in the environment, the project has the potential to exacerbate the risk of bushfire if construction and operation activities are not designed or carried out in a way that minimises this risk. Bushfire is capable of damaging infrastructure associated with the project and consequently impacting upon the safety of staff and contractors during the construction and operation of the project. Bushfire emanating from the construction and operation of the project poses a human safety and property threat within the locality, as well as threatening native flora, fauna, and ecosystems within the locality of the project. Fire suppression operations can be made more challenging as a result of bio-physical risk factors. This includes weather conditions, vegetation characteristics, terrain and aspect, and existing potential ignition sources, which can contribute to the risk of bushfire originating from outside the project in surrounding areas. The addition of activities associated with the construction and operation of the project adds additional risks. The potential ignition of unplanned bushfires from the construction and operation phases of the project are likely to be from the following sources:

- diesel generators;
- storage of flammable gas, liquids (eg fuel) and other hazardous chemicals;
- vehicle and machine movement over long grass;
- sparks generated from the surface infrastructure;
- sparks generated from hot works (eg welders and grinders); and
- human error, such as non-compliance of hot works procedures or incorrect disposal of cigarette butts.



Source: EMM (2022); Veolia (2022); DFSI (2017)

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Major road
- Minor road
- Vehicular track
- Watercourse

Bushfire prone land

- Vegetation Category 1
- Vegetation Category 2
- Vegetation Category 3
- Vegetation Buffer

Bushfire prone land

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.24

creating opportunities

8.9.4 Management measures

The PBP provides an assessment framework for the identification of potential impacts of bushfire upon proposed new assets and establishes six key bush fire protection measures that are to be addressed and collectively form an effective mitigation strategy in order to reduce the bush fire impacts. These six key bushfire protection measures are:

- the provision of clear separation of buildings and bush fire hazards, in the form of a fuel-reduced asset protection zone (APZ);
- construction standards and design;
- appropriate access standards for residents, fire fighters, emergency service workers and those involved in evacuation;
- adequate water supply and pressure;
- emergency management arrangements for fire protection and/or evacuation; and
- suitable landscaping, to limit fire spreading to a building.

The Table 8.38 below provides a summary of recommendations to achieve compliance with the relevant requirements of PBP for bushfire protection for asset protection zones (APZs), access, water supply, provision of services, construction standards, landscaping, issues specific to Class 5–8 buildings and hazardous industry, and emergency management.

A site inspection was not possible due to COVID-related travel restrictions. Therefore, the project has been conservatively assessed as forest and freshwater wetlands to be the predominant vegetation formations for the purpose of the BFPA.

The BFPA determined the APZ and bushfire attack level (BAL) via the PBP. BAL is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. Figure 8.25 displays the APZs and their location in relation to the project.

Table 8.38 Bushfire management and mitigation measures

Impact/risk	ID	Measure	Timing
Asset protection zones (APZs)	BF1	APZs are established for the project to achieve BAL 12.5. The following APZ objectives have been met: • APZs are provided commensurate with the construction of the buildings. • A defendable space is provided. • Vegetation is managed within APZs, in accordance with the requirements of Appendix 4 of PBP. • The APZs is managed in perpetuity. • APZ maintenance is practical, soil stability is not comprised and the potential for crown fires is minimised.	Construction and operation

Table 8.38 Bushfire management and mitigation measures

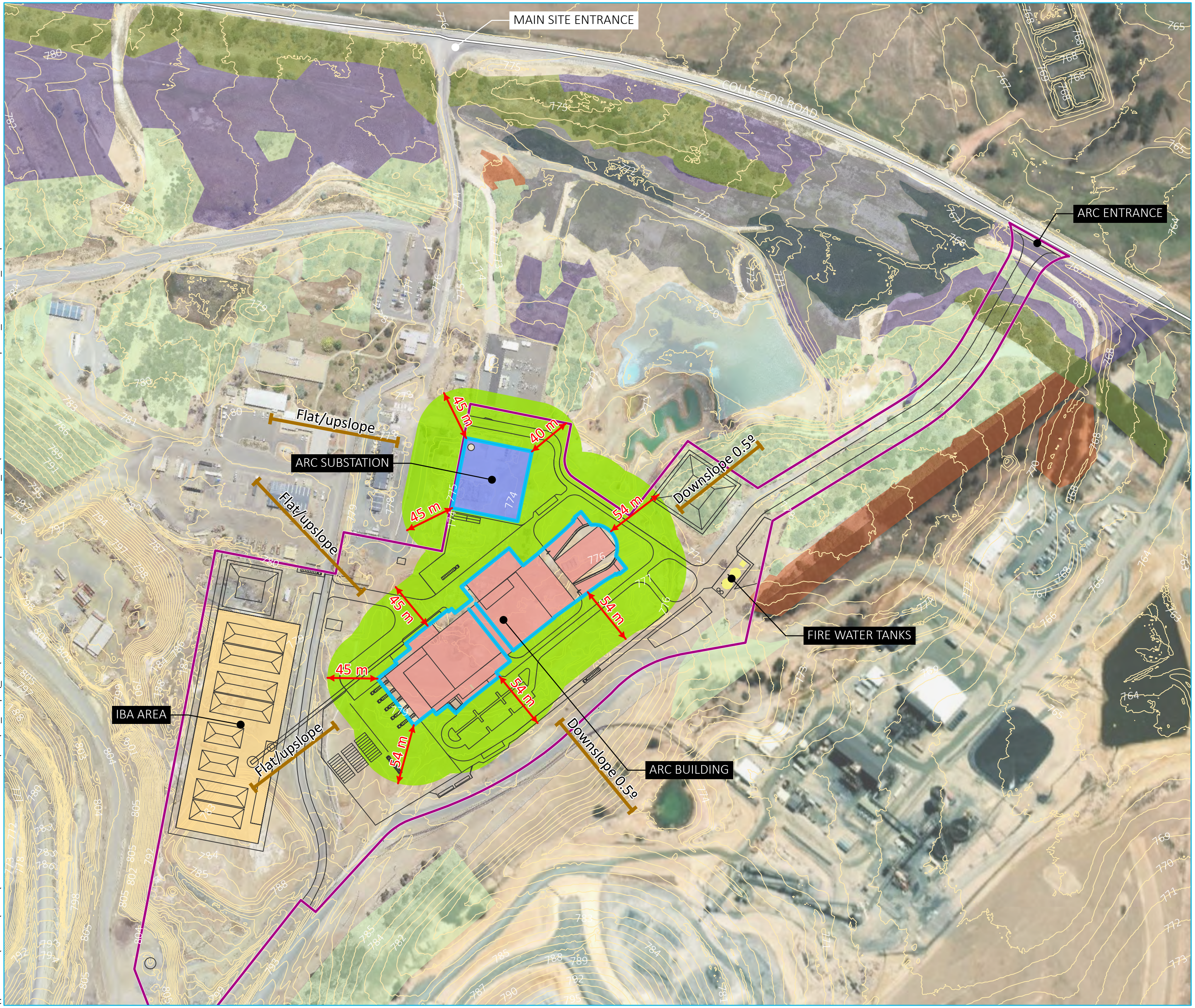
Impact/risk	ID	Measure	Timing
Access for firefighting operations	BF2	Primary and secondary access is maintained, upgraded and/or constructed to comply where possible with performance criteria and/or acceptable solution requirements of PBP 2019 including: • Fire fighting vehicles should be provided with safe, all-weather access to structures and hazard vegetation. • The capacity of access roads should be adequate for fire fighting vehicles. The capacity of road surfaces and any bridges/ causeways should be sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges and causeways must clearly indicate load rating. • There must be appropriate access to water supply. Hydrants should be provided in accordance with relevant clauses (if any) of AS2419.1:2017. • Firefighting vehicles must be able to access the building/s and exit the property safely including: – The internal road network provides numerous alternative access routes for all buildings. – Access roads have a minimum 4 m carriageway width. – Access roads have passing bays every 200 m that are 20 m long by 2 m wide, making a minimum trafficable width of 6 m at the passing bay. – A minimum vertical clearance of 4 m is maintained to any overhanging obstructions, including tree branches. – Internal roads are through-roads, and large hard-stand areas provide suitable turning areas exceeding the requirements of Appendix 3 of PBP. – Curves have a minimum inner radius of 6 m and are minimal in number to allow for rapid access and egress. – The minimum distance between inner and outer curves is 6 m. – The crossfall is not more than 10 degrees. – Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed road.	Construction
Water supplies	BF3	Water supply requirements for firefighting, including the provision of hydrants and hose reels, are designed, and constructed in accordance with the relevant Standards and PBP 2019 including: • Adequate water supply must be provided for firefighting purposes ie reticulated water is to be provided to the project where available. • Water supplies must be located at regular intervals, and the water supply must be accessible and reliable for firefighting operations. Fire hydrant spacing, design and sizing must comply with the relevant clauses of AS 2419.1:2017. Hydrants must not be located within any road carriageway. • Fire hydrant flows and pressures must comply with the relevant clauses of AS 2419.1:2017. • The integrity of the water supply must be maintained. All above-ground water service pipes must be metal, including and up to any taps. Above ground water storage tank must be of concrete or metal.	Construction

Table 8.38 Bushfire management and mitigation measures

Impact/risk	ID	Measure	Timing
Electricity services	BF4	Electricity supply and distribution is provided in accordance with the requirements of PBP 2019 and the relevant standards including: • Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings. Where practicable, electrical transmission lines should be underground. Where overhead electrical transmission lines are proposed: – lines must be installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas; and – no part of a tree should be closer to a power line than the distance set out in ISSC3 (2016) Guideline for Managing Vegetation Near Power Lines.	Construction
Gas services	BF5	• Location and design of gas services must not lead to ignition of surrounding bushland or the fabric of buildings, such as: – Reticulated or bottled gas bottles must be installed and maintained in accordance with AS/NZS 1596 (2014), the requirements of relevant authorities and metal piping is to be used. – All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10 m and shielded on the hazard side. – Connections to and from gas cylinders should be metal. – Polymer sheathed flexible gas supply lines are not used. – Above ground gas service pipes should be metal, including and up to any outlets.	Construction
Construction standards	BF6	• The proposed building should withstand bush fire attack in the form of embers, radiant heat and flame contact. BAL has been determined in accordance with Table A1.12.5 of PBP; and construction provided in accordance with the National Construction Code (NCC) (NCC, 2019) and as modified by Section 7.5 of PBP. • Proposed fences and gates are designed to minimise the spread of bush fire and should be constructed of non-combustible material. • Proposed Class 10a buildings (garage, car port, shed or the like) should be designed to minimise the spread of bush fire. Class 10a buildings are either located >6 m from other buildings (in which case no other bushfire protection measures are required) or, if located within 6 m of other buildings, are provided with APZs and constructed to the appropriate BAL.	Construction
Landscaping	BF7	• Landscaping should be designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions. Compliance with the NSW RFS 'Asset protection zone standards' (see Appendix 1 of the BFPA); a clear area of low-cut lawn or pavement should be maintained adjacent to the building/s; fencing should be constructed in accordance with Section 7.6 of PBP; and trees and shrubs should be located so that: – the branches will not overhang the roof; – the tree canopy is not continuous; and – any proposed windbreak is located on the elevation from which fires are likely to approach.	Construction

Table 8.38 Bushfire management and mitigation measures

Impact/risk	ID	Measure	Timing
Issues specific to buildings of Class 5 to 8 under the NCC	BF8	• Should provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation. • Should provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation. • Should provide adequate services of water for the protection of buildings during and after the passage of bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building. • Storage and handling of hazardous materials must be in accordance with: – AS1940:2017 The storage and handling of flammable and combustible liquids. – The recommendations of the preliminary hazards analysis (Appendix EE).	Construction
Issues specific to hazardous industry	BF9	• Must address the appropriate protection measures to be provided commensurate with the bush fire hazards and associated risks. Care should also be taken to ensure that such facilities do not impact on existing developments. Solutions include: – Implement the recommendations of the preliminary hazards analysis (Appendix EE). – Provision of access, water, electricity and gas supply in accordance with Sections 3.2, 3.3, 3.4 and 3.5 of the BFPA.	Construction
Bushfire Emergency Management and Evacuation Plan	BF10	• A Bush Fire Emergency Management and Evacuation Plan should be prepared by the operator consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*, and AS3745:2010. • The plan should include responsibilities associated with and details of: – site specific hazards and risk; – procedures to maintain bushfire awareness; – bushfire mitigation measures; – fire preparedness actions; – fire response actions including responses to emergency alerts issued by emergency services; and – bushfire recovery requirements.	Pre-construction



KEY
- Development footprint
- Site layout detail
- Major road
- Contour 1 m
- ARC building
- ARC substation
- Fire water tanks
- IBA area
- Asset Protection Zone (APZ)

Bushfire construction standards AS3959(2018)*
- BAL-12.5

Plant community type (PCT) mapping (EMM 2021)

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion
- Native planted
- Exotic planted
- Regrowth
- Derived native grassland
- Exotic derived native grassland

PCT 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
- Moderate
- Poor

Other
- Waterbody

* Please refer to additional construction requirements for BAL levels which are contained in 'Planning for Bushfire Protection' (2019).

Project asset protection zones

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.25

Source: EMM (2022); Veolia (2022); Travers (2022); DFSI (2017)

0 100 200 m

GDA 1994 MGA Zone 55

N

EMM creating opportunities

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8.10 Biodiversity

8.10.1 Introduction

A Biodiversity Development Assessment Report (BDAR) has been prepared by EMM and is provided in Appendix Y. The BDAR assesses the potential impact of the project on terrestrial biodiversity under the NSW BC Act and the Commonwealth EPBC Act, describes biodiversity offset requirements under the Biodiversity Assessment Method (BAM) and recommends measures to minimise impacts.

The relevant biodiversity SEARs and how they are addressed, are summarised in Appendix A and Section 1.4 of the BDAR. Section 1.4 of the BDAR also includes and addresses specific requirements from Biodiversity, Conservation and Science.

Note, the project study area (study area) represents the broad area of investigation, which was considered during the biodiversity assessment and field study.

This chapter provides a summary of the BDAR including the existing environment, survey results, impact assessment and mitigation measures.

8.10.2 Existing environment

i Native vegetation

For the purposes of the BDAR, a landscape assessment area was determined based on the development footprint, plus a 1,500 m buffer, shown in Figure 8.26. This area was assessed using vegetation mapping collected as a part of field surveys, aerial photograph interpretation and existing broad scale vegetation mapping datasets.

The landscape assessment area is a total of 1693.73 ha. Of this, approximately 9.46% is native vegetation. The majority of this is outside the development footprint.

Vegetation within the landscape assessment area is highly modified and disturbed due to historical clearing for agricultural practices, mining and infrastructure development. The project study area is predominantly cleared of vegetation, but contains:

- several planted corridors of moderately sized Eurabbie (*Eucalyptus bicostata)* and Cootamundra Wattle (*Acacia baileyana*);
- thick regrowth of Silver Wattle (*Acacia dealbata*) across parts of the historic quarry area;
- derived native grassland patches closer to Collector Road;
- a Common Reed (*Phragmites australis*) wetland, in the headwaters of Crisps Creek;
- a corridor of mature Radiata Pine (*Pinus radiata*) with no understorey; and
- exotic grassland previously used for agriculture.

The most relevant vegetation mapping data set for the area, *Biometric Vegetation Compilation for the South East Local Land Services Region* (ELA 2015) maps five biometric vegetation types (BVTs) within the broader landscape assessment area corresponding to five plant community types (PCT). Of these, only one PCT is mapped within the development footprint:

- PCT 1191 Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion.

The mapped extent of PCT 1191 within and surrounding the development footprint is shown in Figure 8.26. All areas of PCT 1191 in the development footprint are highly modified, consisting of derived native grasslands, tall regenerating shrubland and a remnant native understorey under planted native tree species. There is a total of 1.55 ha of PCT 1191 within the development footprint.

An additional 0.15 ha of vegetation within the development footprint was assigned as exotic grassland.

One additional PCT, PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion, is located immediately adjacent to the ARC development footprint (see Figure 8.26). Originally a portion of the ARC access road traversed this PCT, however this area was identified for avoidance, and the development footprint was subsequently modified to excluded direct impacts to PCT 1256.

ii Threatened ecological communities

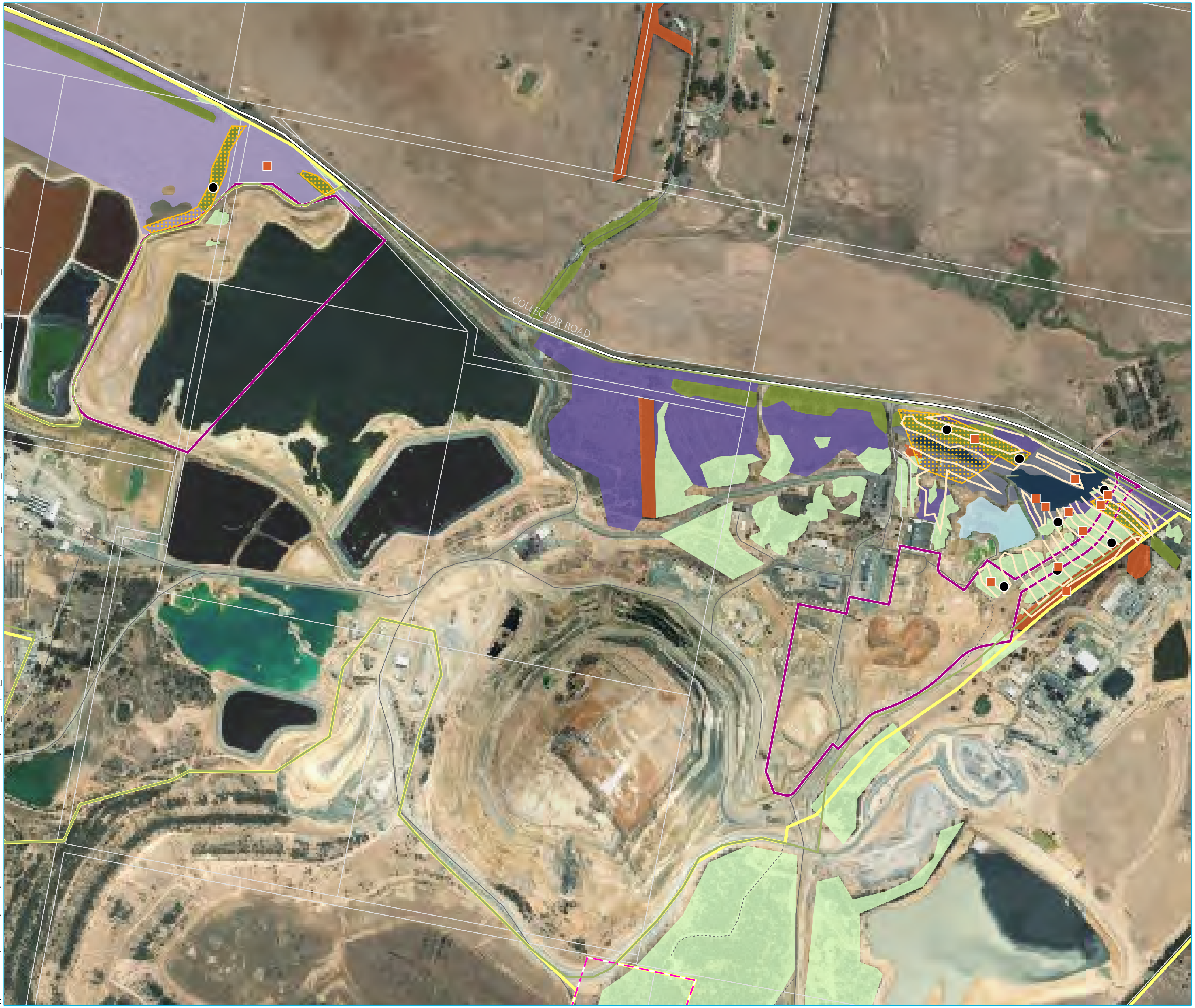
One threatened ecological community (TEC) has been recorded in the development footprint, *Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions,* which corresponds to PCT 1191. This TEC is listed as critically endangered under the BC Act, but is not listed under the EPBC Act. The occurrence of the TEC in the subject land is in very poor condition, consisting only of Acacia-dominated regrowth, derived native grassland and the understorey component of an area of planted with non-locally-indigenous trees.

A second TEC, associated with PCT 1256, occurs adjacent to the development footprint, *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions*. This TEC is listed as critically endangered under the BC Act but is not listed under the EPBC Act. The occurrence of the TEC in the study area is in poor condition, consisting only of a low diversity of remnant native wetland grasses, sedges, rushes and forbs. Due to changes in project design this PCT and TEC will not be directly impacted, as described previously.

iii Threatened species

Based upon the mapping of PCT 1191, twenty-three ecosystem credit species were predicted to occur within the subject land. All ecosystem credit species were retained within the assessment, with the exception of Glossy Black-cockatoo (*Calyptorhynchus lathami*) (foraging habitat). This species was removed from the assessment, as its habitat constraint (presence of Allocasuarina and Casuarina species) does not occur within the subject land.

Twenty-six species credit species (candidate species), comprising thirteen candidate flora species and thirteen candidate fauna species were initially predicted to occur in the BAM Calculator, prior to further assessment in Table 5.2 of the BDAR (Appendix Y).



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Source: EMM (2022); Veolia (2022); DFSI (2017); DPI (2013)

0 250 500
m
GDA 1994 MGA Zone 55
N

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Anabat location
- BAM plot
- Flora transect
- Koala SAT location
- Major road
- Minor road
- Vehicular track
- Cadastral boundary

Plant community type (PCT) mapping

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- DNG
- Exotic DNG

PCT 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

- Moderate
- Poor

Other

- Waterbody

Mapped PCTs and field survey locations

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Environmental impact statement
Figure 8.26

EMM
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Flora and Fauna habitat

The study area has an extensive history of disturbance associated with agricultural practices and construction of infrastructure. The modified and fragmented vegetation present provides limited refuge or foraging habitat for fauna. Fauna habitat features possibly important for threatened species were limited to areas of wetland vegetation and artificial water bodies with fringing vegetation that have potential to be occupied by threatened species of frogs.

Areas of regenerating woodland, native and exotic tree planting contain a low abundance of fallen timber and a sparse to moderate litter cover. No hollow-bearing trees are present within the development footprint. The groundcover consists of a sparse to moderate cover of native grasses, including tussock grasses, and forbs. These areas represent marginal foraging habitat for some species of threatened woodland birds, raptors and bats that are more tolerant of habitat modification and fragmentation. Due to its modified structure, fragmentation and lack of mature and hollow-bearing trees this habitat is unlikely to be utilised for breeding by any threatened bird or bat species.

Waterbodies within the study area have been modified through historical clearing, altered drainage patterns and runoff from adjacent agricultural, mining and industrial activities. Two threatened frog species have potential to occur in this habitat, the Green and Golden Bell Frog and Yellow-spotted Tree Frog. These have been associated with similarly disturbed and modified habitats in agricultural and industrial settings. Several common frog species were opportunistically recorded during surveys undertaken to date, indicating that frog habitat is present. It is noted that the identified frog habitat is outside of the subject land, due to project re-design to avoid areas of PCT 1256.

iv Targeted survey

The twenty-six candidate species predicted by the BAM Calculator were assessed in accordance with Sections 5.2.1 and 5.2.2 of BAM (DPIE 2020), as provided in Table 5.2 of the BDAR (Appendix Y). As a result of the assessment, the species requiring targeted survey are identified in Table 8.39.

Table 8.39 Candidate species credit species requiring further assessment

Scientific name	Common name	EPBC Act	BC Act	Flora or fauna	Target survey completed?
Caladenia tessellata	Thick Lip Spider Orchid	Vulnerable	Endangered	Flora	Yes – 6–8 October 2021
Calotis glandulosa	Mauve Burr-daisy	Vulnerable	Vulnerable	Flora	Yes – 6–8 October 2021
Commersonia prostrata	Dwarf Kerrawang	Endangered	Endangered	Flora	Yes – 6–8 October 2021
Diuris aequalis	Buttercup Doubletail	Vulnerable	Endangered	Flora	Yes – 6–8 October 2021
Eucalyptus aggregata	Black Gum	Vulnerable	Vulnerable	Flora	Yes – 6–8 October 2021
Eucalyptus macarthurii	Camden Woollybutt	Endangered	Endangered	Flora	Yes – 6–8 October 2021
Leucochrysum albicans var. *albicans*	Hoary Sunray	Endangered	Not listed	Flora	Yes – 6–8 October 2021

Table 8.39 Candidate species credit species requiring further assessment

Scientific name	Common name	EPBC Act	BC Act	Flora or fauna	Target survey completed?
Myotis macropus	Southern Myotis	Not listed	Vulnerable	Fauna	Yes – 6–8 October 2021
Phascolarctos cinereus	Koala	Vulnerable	Vulnerable	Fauna	Yes – 6–8 October 2021
Prasophyllum petilum	Tarengo Leek Orchid	Endangered	Endangered	Flora	Yes – 6–8 October 2021
Rutidosis leptorrhynchoides	Button Wrinklewort	Endangered	Endangered	Flora	Yes – 6–8 October 2021
Swainsona sericea	Silky Swainsona	Not listed	Vulnerable	Flora	Yes – 6–8 October 2021
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	Flora	Yes – 18 January 2022

Targeted flora surveys were completed from 6–8 October 2021, in accordance with NSW (DPIE 2020) guidelines and targeting those flora species listed within Table 8.39. Further targeted survey for Austral Toadflax (*Thesium australe*) was completed on 18 January 2022 within the prescribed survey period of November to January for this species.

Targeted fauna surveys were undertaken over three days between 6–8 October 2021 in suitable habitat in the project study area, for the fauna species listed within Table 8.39. Surveys were conducted in accordance with various NSW and Commonwealth guidelines, as detailed within the BDAR (Appendix Y).

Figure 8.26 shows the targeted flora and fauna survey locations.

Targeted surveys did not record threatened flora species, despite surveys being undertaken during favourable seasonal timing and prevailing weather conditions.

No threatened fauna species, including the Southern Myotis or Koala, were recorded during targeted surveys.

v Groundwater dependent ecosystems

The groundwater dependant ecosystems atlas (2021) identifies no areas within the study area that are aquatic or terrestrial groundwater dependant ecosystems. Within 5 kms of the study area there are several vegetated landscapes and creeks which may interact with the development footprint. The location of the terrestrial GDEs upstream of the Crisps Creek catchment and the development footprint, indicated that the risk of impacts on these terrestrial GDEs is low and a separate aquatic biodiversity assessment was deemed unnecessary. Aquatic GDEs in the area may be impacted by the project however these ecosystems are likely to be dependent primarily on surface water flow. The groundwater impact assessment (Appendix U) details the impacts on local groundwater resources and concludes that impacts on groundwater are unlikely to be significant.

8.10.3 Potential impacts

The development footprint has maximised the use of disturbed areas, which assists in minimising impacts to biodiversity. Of the 38.4 ha within the development footprint, 1.55 ha comprises native vegetation. The ARC access road is the primary element of the project that impacts vegetation, and the footprint has been refined to minimise impacts as far as practicable, including the avoidance of a TEC. Potential impacts are described below.

i Potential direct and indirect impacts

The design of the project has been iterative to avoid and minimise impacts on threatened biodiversity. Key avoidance measures that have been implemented include:

- redesigning the project to avoid the placement of the ARC access road through wetland areas mapped as PCT 1256, which avoids potential impacts on threatened frog species;
- avoiding disturbance to the catchment area and hydrology of the wetland areas; and
- minimising the impact on PCT 1191 (planted native corridor and the derived native grasslands).

The reduction of impact on PCT 1191 (native planted component) provides mature vegetation connectivity and habitat in the broader landscape.

The project will result in the following direct impacts to threatened biodiversity:

- clearing of 1.55 ha of native vegetation in the development footprint;
- loss of fauna habitat associated with native and exotic vegetation clearing; and
- increased fragmentation of vegetation remnants.

Wherever possible, direct impacts have been avoided and/or minimised through the design of the development footprint.

Indirect impacts will be managed and mitigated through the implementation of the biodiversity management measures detailed in Section 8.10.4. Given the highly modified condition of all native vegetation and habitat affected by the project and the planned implementation of mitigation measures, indirect impacts on biodiversity would be negligible.

Residual impacts will be compensated through implementation of the biodiversity offset scheme (BOS).

ii Prescribed impacts

A prescribed impact is a specific type of impact that is described in Section 6 of the BAM (DPIE, 2020) and must be assessed under the BOS.

The biodiversity assessment has given consideration to prescribed impacts on threatened species and communities recorded or assumed to be present within the development footprint, as per Section 6 of the BAM (DPIE 2020). The prescribed impacts relevant to the project are documented in Table 8.40 below.

Table 8.40 Prescribed biodiversity impacts relevant to the development footprint

Prescribed impact	Justification
Impacts of development on the habitat of threatened species or ecological communities associated with:	
• Karst, caves, crevices, cliffs, and other features of geological significance.	No karst (eroded limestone landscape) features are found in the development footprint. No cliffs are found in the development footprint.
• Human made structures.	The project is unlikely to affect habitat values provided by human made structures.
• Non-native vegetation.	Minimal areas (~0.15 ha) of non-native vegetation will be impacted by the project. This area is unlikely to support any threatened species.

Table 8.40 Prescribed biodiversity impacts relevant to the development footprint

Prescribed impact	Justification
Impacts on areas connecting threatened species habitat, such as movement corridors.	The project will have a minor impact on the connectivity of habitat within the development footprint due to the further removal and fragmentation of vegetation. Landscaping with native species throughout the development footprint will increase the vegetated area from its current extent. Assessed in Section 7.2.1 of the BDAR (Appendix Y) and summarised in Table 8.41.
Impacts that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining).	The project may result in minor impacts to water quality downstream. Assessed in Section 7.2.2 of the BDAR (Appendix Y) and summarised in Table 8.41 below.
Impacts on threatened and protected animals from turbine strikes from a wind farm.	Not relevant to the project as it is not a wind farm.
Impacts on threatened species or fauna that are part of a TEC from vehicle strikes.	The project will involve a temporary increase in traffic in the area during construction. Several threatened species have been identified possibly occurring within the development footprint that are likely to be susceptible to impact from vehicle strikes. Assessed in Section 7.2.3 of the BDAR (Appendix Y) and summarised in Table 8.41.

As identified within Table 8.40, the project may result in the following prescribed impacts:

- impacts on areas connecting threatened species habitat such as movement corridors;
- impacts on water quality, water bodies and hydrological processes that sustain threatened species; and
- impacts on threatened species or fauna that are part of a TEC from vehicle strikes.

These potential prescribed impacts are assessed in Section 7.2.2 of the BDAR (Appendix Y) and summarised in Table 8.41 below.

Table 8.41 Further assessment of prescribed impacts

Impact type	Associated features of site	Potential impacts	Relevant threatened species	Consequences of impacts on threatened entities
Impacts on areas connecting threatened species habitat such as movement corridors.	Native tree planting strips and sparse woodland regrowth that provide a tenuous local-scale connection between the regenerating woodland of the subject site and immediate surrounds and the more intact woodland on hills to the south.	The project will result in removal of 1.43 ha of regrowth and planted woodland at the edge of the corridor and create a new road division between the wetland and regenerating and planted woodland.	• Frogs • Koala • Spotted-tail Quolls • Threatened bird species	Frogs utilise grassed area immediately beside water bodies for foraging at night. The project will include a small, vegetated corridor between the wetland and the road, allowing the species to forage in all areas surrounding the wetland habitat. The project is unlikely to significantly impact the ability of threatened frog species to move through the landscape between areas of preferred habitat. Koalas and Spotted-tail Quolls may occur infrequently and would be unlikely to remain in the area due to lack of high foraging potential and lack of connectivity with other woodland areas. Threatened bird species are highly mobile and will utilise surrounding areas and are highly unlikely to be impacted by the small loss of vegetative cover.
	Wetland/drainage line at the north of the development footprint that connects the wetland area in the development footprint, via a culvert under Collector Road.	The project will not result in removal of wetland vegetation in or at the edge of the corridor. It is unlikely to have a significant effect on this corridor.	• Frogs	The project will have no direct impact on the already highly disturbed riparian vegetation corridors of tributaries of the Crisps Creek due to redesign of access road. The project is unlikely to significantly impact the ability of threatened frog species to move through the landscape between areas of preferred habitat in the Crisps Creek catchment.

Table 8.41 Further assessment of prescribed impacts

Impact type	Associated features of site	Potential impacts	Relevant threatened species	Consequences of impacts on threatened entities
Impact on water quality, water bodies and hydrological processes that sustain threatened species.	Wetland/drainage line at the north of (but not within) the development footprint.	Slightly increased erosion and sedimentation during construction in localised areas. Negligible change to floodplain conditions.	• Yellow-spotted Treefrog • Green and Golden Bell Frog	The slight increased and localised erosion and sedimentation during construction is unlikely to result in significant changes to the species' habitat. Downstream habitat is already significantly affected by erosion, sedimentation, grazing and weed invasion and the project is unlikely to significantly alter habitat suitability for these species in this area. Minimal impact.
Impacts on threatened species or fauna that are part of a TEC from vehicle strike.	All roads likely to be utilised for construction access.	Increased incidence of vehicle strike on publicly accessible roads during construction due to increased traffic.	All threatened animal species that may utilise the project subject land (however no candidate threatened species were detected during targeted surveys).	There may be a small overall increase in the incidence of mortality of individuals of threatened species during construction. Construction traffic speed limits and limitation of construction traffic movements at night would mitigate impacts. The overall long-term impact of vehicle strike associated with the project is unlikely to have a significant impact on populations of threatened species or fauna that are part of a threatened ecological community.

The assessment of prescribed impacts concludes minimal to negligible impacts will be created by the project on the prescribed entities.

iii Serious and irreversible impacts

Additional impact assessment for threatened ecological communities that are also listed as candidate entities for Serious and Irreversible Impacts (SAII) has been undertaken in accordance with the criteria set out in Section 9.1.1 of the BAM (DPIE 2020). The BDAR (Table 7.6 in the BDAR) provides an assessment of the impact of the project on the TEC Werriwa Tablelands Cool Temperate Grassy Woodland, listed as critically endangered under the BC Act, which is associated with PCT 1191. The area within the development footprint that is assessed is 1.55 ha and exists in a highly modified, fragmented, and isolated condition lacking crucial canopy stratum.

Section 9.1.2 of BAM (DPIE 2020) requires additional impact assessment for threatened species that are also listed as candidate entities for SAII. There are no species identified as being at risk of an SAII that require further assessment. The Yellow-spotted Tree Frog is an SAII species, however no habitat associated with the species is within the development footprint, with only marginal potential foraging habitat present in the development footprint. As potential habitat exists adjacent to the development footprint (the areas of PCT 1256 that were avoided due to project re-design), an assessment of impact significance under the EPBC Act, as well as against SAII criteria was undertaken for the species as a precaution.

iv Impacts requiring offset

Impacts to native vegetation requiring offsets in accordance with section 9.2 of BAM (DPIE 2020) are shown in Figure 8.27 and include:

- Direct impacts on 1.55 ha of PCT 1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion, corresponding to the TEC Werriwa Tablelands Cool Temperate Grassy Woodland.

A summary of the ecosystem credits required for all vegetation zones, including changes in vegetation integrity score, are provided in the BDAR.

A total of 31 ecosystem credits are required to offset the residual impacts of the project. A credit report is provided in Appendix B of the BDAR (Appendix Y). These residual impacts will be compensated for through the implementation of a biodiversity offset strategy of obtaining appropriate and BCT approved credits.

As no candidate species were recorded during the targeted surveys, there are no species credits required to be offset for the project.

v Biodiversity offset strategy

Offsets will be provided in accordance with the BOS. Veolia may explore options to create and retire biodiversity credits for the project through establishment and management of a biodiversity stewardship site. However, due to the relatively small biodiversity credit requirement and timeframe constraints of the project, the offset liability for the project is likely to be primarily or entirely met through a combination of the following methods:

- purchase and retirement of available like-for-like biodiversity credits from the biodiversity offsets trading market; and
- payment to the biodiversity conservation fund.

The ecosystem credits to be retired can be retired using like for like community credits that occur within any IBRA subregion that is within 100 kms of the outer edge of the development footprint, or within the Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Murrumbateman, Snowy Mountains and South East Coastal Ranges IBRA subregion (refer to Appendix E of the BDAR).

vi EPBC listed threatened species or communities

An assessment of the likelihood of protected matters listed under the EPBC Act occurring within the subject is presented in Section 8.1.1 of the BDAR.

The likelihood of occurrence assessment found that the study area may provide sub optimal habitat for following EPBC Act listed entities:

- Koala (*Phascolarctos cinereus*) – Endangered;
- White-throated Needletail (*Hirundapus caudacutus*) – Vulnerable;
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered;
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) – Endangered);
- Swift Parrot (*Lathamus discolor*) – Critically Endangered);
- Green and Golden Bell Frog (*Litoria aurea*) – Vulnerable;
- Yellow-spotted Tree Frog (*Litoria castanea*) – Critically Endangered;
- Australian Painted Snipe (*Rostratula australis*) – Endangered;
- Australasian Bittern (*Botaurus poiciloptilus*) – Endangered, and
- Latham's Snipe (*Gallinago hardwickii*) – Migratory.

Assessment of the potential project impacts upon the above listed entities were undertaken in accordance with the Matters of National Environmental Significance; Significant impact guidelines 1.1 (Department of Environment, 2013) (refer to Section 8.1.2 of the BDAR). The assessments conclude that the project is not expected to result in significant impacts on EPBC Act listed biodiversity. The project will not result in a significant impact to any Matters of National Environmental Significance and referral of the project to the DCCEEW is not required.

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KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Major road
- Minor road
- Vehicular track
- Cadastral boundary
- Impacts not requiring offset
- Impacts requiring offset

Plant community type (PCT) mapping

1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- DNG

Impacts requiring offsetting

Source: EMM (2022); Veolia (2022); DFSI (2017); DPI (2013)

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.27

EMM
creating opportunities

8.10.4 Management measures

The project design has been optimised to be located predominantly in areas that lack vegetation, and which have significant historic soil disturbance. Approximately 1.55 ha of native vegetation within the development footprint will be impacted, and offset accordingly. The section of the development footprint that contains native vegetation is primarily in the areas adjacent to Collector Road, where the ARC access road is proposed.

Location and design of the ARC access road has avoided a wetland and stands of mature native vegetation as far as practicable. These stands of vegetation provide an aesthetic buffer and connectivity habitat in the broader landscape. The projects associated surface infrastructure has been designed, where possible, to avoid the sensitive biodiversity areas of the wetland and mature treed areas.

Iterative project planning, informed by the baseline studies outlined above, has allowed a range of impacts to be avoided and others to be minimised throughout the life of the project. To compensate for unavoidable disturbance, biodiversity offsets will be provided.

Key avoidance measures and an iterative design approach has been implemented and includes:

- redesigning the project to avoid the placement of the ARC access road through wetland areas PCT 1256, which avoids potential impacts on threatened frog species;
- avoiding disturbance to the catchment area and hydrology of the wetland area; and
- minimising the impact on the PCT 1191 (planted native corridor and the derived native grasslands).

Table 8.42 below summarises the mitigation measures proposed to minimise the potential for residual impacts on biodiversity.

Table 8.42 Biodiversity management and mitigation measures

Impact/risk	ID	Measure	Timing
Clearing of native vegetation	BIO1	Create healthy vegetation buffer between edge of wetland/woodland areas and the access road by, replacing removed native vegetation with a planted corridor along each side of the access road. Do not use adjacent areas for stockpiling.	During and after construction
Clearing/trampling of native vegetation adjacent to the development footprint	BIO2	To minimise areas of impacted or damaged vegetation, exclude activities from areas outside of the development footprint that contain native vegetation during construction through temporary fencing of footprint during construction.	During construction
Dust impact on native fauna during construction	BIO3	To ensure no significant dust affects fauna or flora, keep dust minimised through work site misting (water truck).	During construction and detailed design
Erosion impacts on local wetland and waterways	BIO4	Minimise any sedimentation of waterways by controlling stormwater and surface water flows during construction; and designing stormwater flows to minimise sedimentation and flash-flooding of wetland.	Detailed design
Causing significant changes to water levels of water bodies	BIO5	Minimise significant changes to water levels in water bodies and maintain the current hydrology regime by controlling stormwater and surface water flows during construction.	During and after construction

Table 8.42 Biodiversity management and mitigation measures

Impact/risk	ID	Measure	Timing
Fauna strike by vehicles or plant	BIO6	Limit number of animals struck by vehicles and plant, by imposing speed limits on access roads and limiting night works on the access road. Conduct pre-clearance surveys and clearing supervision.	During and after construction
Introduction or increase presence of biosecurity issues eg exotic flora, fauna, pathogens.	BIO7	Complete site hygiene measures for vehicles and staff to ensure no biosecurity issues are introduced or encourage into the study area. Use uncontaminated fill and landscaping products.	During and after construction
Direct impacts on marginal foraging habitat for the Yellow-spotted Bell Frog and Green and Golden Bell Frog	BIO8	Incorporate frog habitat features into landscape design in areas of the subject site and adjacent areas that are bare of native vegetation from the access road to the north-west near PCT 1256 (Tableland Swamp Meadow). Habitat features should include ephemeral pond depressions, shelter habitat elements (eg large woody debris from clearing area) and tussock grass, sedge and rush plantings.	During and after construction
Residual vegetation and habitat impact	BIO9	Offsets will be provided in accordance with the biodiversity offset scheme as outlined in Section 7.6 of the BDAR (Appendix Y) or Section 8.10.3v).	During and after construction

The BDAR has been prepared in accordance with the BAM (DPIE 2020), and biodiversity-related SEARs issued by DPE.

Under the BAM, the project requires 31 ecosystem credits to offset impacts on native PCTs and ecosystem credit species. The offset liability for the project will be met by Veolia and described in a BOS.

The BDAR has also considered impacts on species listed under the EPBC Act (Section 8.10.3). The project is not expected to result in significant impacts on EPBC Act listed biodiversity matters.

Assessments of SAII against the criteria set out in Section 9.1.1 of the BAM (DPIE 2020) was completed on the Threatened Ecological Community (TEC) Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions concluded that this TEC exists in poor condition in the development footprint.

Biodiversity impacts due to the project are not significant and have been minimised during design of the project. Potential impacts will be managed through the implementation of management measures, and offsetting for residual impacts that cannot be avoided.

8.11 Aboriginal Heritage

8.11.1 Introduction

An Aboriginal cultural heritage assessment (ACHA) was prepared by EMM to support this EIS and can be found in Appendix Z. The ACHA documents the results of archaeological investigations undertaken to identify the extent and significance of any physical remains and intangible values of past Aboriginal visitation, use and occupation within the development footprint.

The ACHA was prepared in general accordance with the *Code of Practice for Archaeological Investigation in NSW* (DECCW 2010), and guided by the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011). The relevant SEARs and how they have been addressed, are summarised in Appendix A and Section 1.5.1 of the ACHA (Appendix Z). A summary of the Aboriginal consultation, existing environment, impact assessment and mitigation measures are provided below.

Note, the project study area (study area) represents the broad area of investigation, which was considered during the ACHA and field study.

8.11.2 Aboriginal consultation

Aboriginal consultation for the project has been undertaken in accordance with procedures set out in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010). These guidelines identify a four-stage process, which is summarised for the project in Table 8.43. A complete consultation log is provided in Annexure B of the ACHA (Appendix Z).

Table 8.43 Summary of Aboriginal consultation undertaken for the project

Consultation stage	Description	Date initiated	Date completed	Notes
1	Government Agency Pre-Notification	28 May 2021	–	Additional details provided in Annexure B.4 of the ACHA (Appendix Z).
	Advertisement in the *Goulburn Post*	9 June 2021		A tearsheet is provided in Annexure B.4 of the ACHA (Appendix Z).
	Notification and registration of potential Aboriginal stakeholders	9 June 2021	23 June 2021	Additional details are provided in Annexure B.4 of the ACHA (Appendix Z).
2/3	Presentation of information about the proposed project; and gathering information about cultural significance	2 July 2021	30 July 2021	Additional details are provided in Annexure B.5 of the ACHA (Appendix Z).
	Aboriginal Focus Group Meeting	20 August 2012	23 August 2021	Additional details are provided in Annexure B.6 of the ACHA (Appendix Z).
	Aboriginal Focus Group Meeting	20 August 2012	23 August 2021	Additional details are provided in Annexure B.6 of the ACHA (Appendix Z).
	Site investigation	22 November 2021		Attended by EMM and four RAPs
4	Review of draft report	17 September 2021	15 October 2021	Additional details are provided in Annexure B.6 of the ACHA (Appendix Z).

Overall, the consultation process identified 48 Aboriginal stakeholders in the region (Annexure B.1 of the ACHA (Appendix Z)). Subsequently following a notification process, some 14 of these registered an interest in the project (Annexure B.2 of the ACHA (Appendix Z)). These included: Pejar Local Aboriginal Lands Council, Didge Ngunawal Clan, Ginninderra Aboriginal Corporation, Corroboree Aboriginal Corporation, Muragadi, Konanggo Aboriginal Cultural Heritage Services, Ngunnawal Elders Corporation, Yurwang Gundana Cultural Heritage Services, Ngunawal Heritage Aboriginal Corporation, Woka Aboriginal Corporation, Freeman & Marx Pty Ltd, Yurrandaali Cultural Services, Thunderstone Aboriginal Cultural Services Pty Ltd, and Gunjeewong Aboriginal Corporation.

Information on the project and on the proposed assessment methodology was provided to these organisations, or RAPs, in July 2021. A site investigation was proposed for August 2021, however, due to COVID-related travel restrictions, it was not possible at the time. Both EMM and RAP personnel were residents in either the Greater Sydney or ACT areas, and this restricted visitation to the Eco Precinct both by Veolia (for the safety of their employees) and NSW Health public health orders. To allow the RAPs an opportunity to get an indication of the project and conditions of the development footprint, a series of online meetings was offered. Nine of the RAPS participated in three on-line meetings held between 20–23 August 2021. The online meetings included an outline of the project, a history of the site (which has been subject to extensive impacts in the past), and a virtual tour of the development footprint using both maps and photographs taken earlier in the project. The outcomes of these meetings are presented in Section 2.4 and Annexure B.6 of the ACHA (Appendix Z).

The final stage included the distribution of a draft version of the ACHA to the RAPs for review, input and comment. This process is outlined further in Table 8.43 above and Section 2.4 of the ACHA (Appendix Z).

Following extensive feedback of the desire for a site inspection and with the easing of restrictions, a site investigation was able to be undertaken on 22 November 2021. The site visit was offered to a number of RAPs; four attended, including the Yurwang Gundana Cultural Heritage Services, Ngunawal Heritage Aboriginal Corporation, Freeman and Mark Pty Ltd, and Konanggo Aboriginal Cultural Heritage Services.

Following the site investigation, discussions were undertaken with these participants, and no concerns over the project were identified. It was acknowledged by RAPs that the project area had been subject to extensive disturbance and the presence of tangible cultural materials was unlikely. The representative of the Konanggo Aboriginal Cultural Heritage Services indicated that this was 'sick Country' given the level of past disturbance, but that through providing the opportunity for attending the site, a process of community rejuvenation and reconciliation was being achieved; and there was a recommendation for subsequent interpretation and/or acknowledgement of Country to continue this reconciliation. Veolia propose to explore this through their broader established reconciliation processes. No specific intangible cultural values were identified during the site investigation.

8.11.3 Existing environment

Evidence suggests that archaeologically, the region is believed to have been first occupied during the Late Pleistocene period, approximately 21,000 years before present (BP) (Flood 1996 in AMBS 2012, p.12; Austral 2011, p. 26).

Understanding environmental context assists with predictions of archaeological potential, such as the likelihood of archaeological material being present in the landscape, its spatial distribution and its preservation. Landscape features were an important factor for the choice of camping and transitory and ceremonial areas used by Aboriginal people. Similarly, these landscape features and historical land-use plays a role in the level of preservation and the integrity of archaeological sites.

i Landscape overview

The project lies within the south eastern Highlands bioregion, which is bounded by the Australian Alps and south western slopes to the south and west. The bioregion covers the dissected ranges and plateau of the Great Dividing Range that are topographically lower than the Australian Alps, which lie to the south-west. It extends to the Great Escarpment in the east and to the western slopes of the inland drainage basins (NSW NPWS 2003, p. 20). Specifically, the development footprint is situated within the Monaro subregion, which is characterised by a sloping plateau, rising from 600 m in the north to 1,200 m in the south. This increase in elevation is associated with a ridgeline of the Great Dividing Range, which runs through the Eco Precinct in a north-south alignment. However, the original topography has been extensively altered, primarily due to the excavation of the mine void, emplacement of waste rock dumps, and construction of evaporation and storage dams.

The Great Dividing Range and the Lachlan Fold Belt define the geographical and topographical elements of the development footprint. The underlying geology is formed of Palaeozoic granites, metamorphose sedimentary rocks and Tertiary basalts (NSW NPWS 2003). The region within which the project sits has been named 'Lake George Gate'; for here, as described by Flood (1973, p. 12–13), there is a complete break in the Great Dividing Range, forming a natural route across the Southern Tablelands.

The subregion features numerous shallow lakes and swamps, although many are closed basins. Lake George (*Weereewa* or *Ngara*) is located approximately 8 km west of the project, which represents a significant natural feature that is well documented as an Aboriginal meeting place and an area with cultural value (AMBS 2012, p. 13; Rosen 2018, p.15). Lake Bathurst and the Shoalhaven River are situated a comparable distance to the east, and are similarly important bodies of water for past social and economic use.

Climatically, the development footprint is an upland environment, and during significant downturns in the past would have been fairly inhospitable to long term or extensive occupation. As such, it was probably used only ephemerally or seasonally by Aboriginal people.

ii Soil landscape overview

Soil landscape mapping by the Soil Conservation Service of NSW and the DPE indicates the majority of the project is classified as disturbed terrain. Disturbed terrain is defined as terrain that has been disturbed by human activity to a depth of at least 100 cm. The original soil in this landscape has been removed, greatly disturbed and/or buried, and the landscape generally levelled. Thus, historically, the development footprint of the project has likely been impacted to significant depths. Typically, cultural material is constrained to the topsoil units (ie A1 horizon) and the disturbance and/or removal of this unit has likely adverse implications regarding the potential for and survivability of cultural materials.

Where not disturbed, the soil profiles of the project have residual skeletal characteristics, with deeper colluvium found in localised environments typically at the base of slopes.

iii Land use and disturbance

The project has been subject to extensive previous disturbance from pastoral, mining and recent waste management activities. Overall, there appears to be no areas of the development footprint that has been unaffected by agriculture, post-contact settlement, and more recent activities. While earlier settlement and pastoral activities may have only superficially impacted the upper soil profile that has the potential to contain cultural materials, the last 50 years of development has seen significant earthworks within the development footprint.

Across the majority of the development footprint, such impacts have removed at least the top metre of the upper soil profile, and which may extend >2 m in several locations. Based on these findings, it is considered that no parts of the development footprint retain an intact natural soil profile.

iv Ethno-historical context

The project is on *Ngunawal* land, which Tindale (1974), describes as extending from Queanbeyan to Yass, Tumut to Boorowa and east to beyond Goulburn on highlands west of the Shoalhaven River. The project appears to be on a boundary, and may also have associations with the *Gundungurra* language group to the north, *Yuin* language to the east, and *Ngarigo* language to the south. Reports indicate that at the initial time of white settlement in the Canberra region, the Aboriginal population was estimated between 400 and 500 people, however this would fall to 45 by 1848 (Dibden 2012, p.24).

Lake George and the surrounding ridgeline were central places of high importance for the *Ngunawal* and their neighbours. Lake George is recognised in previous studies as a meeting place of spiritual importance and an important stop on a major travelling route stretching from Yass in the west to Gundaroo and Lake George, and from thence to Queanbeyan and onwards eventually to the east coast.

However, while historical information provides several observations in relation to the early nineteenth century Aboriginal society, in particular at nearby Goulburn and Lake George, no site-specific areas of activity were identified. No sites of cultural value, nor association with nearby Lake George, were established within the development footprint during the Aboriginal consultation for this project.

v Archaeological context

The region has been subject to both academic and more recent cultural heritage management investigations. The latter dominated by the establishment of numerous wind farms around Lake George. These studies suggest that the region was visited and/or occupied by Aboriginal people for >20,000 years, although the vast majority of cultural deposits date to the last 5,000 years as climatic conditions stabilised. Visitation then appeared to remain seasonal and/or infrequent, perhaps reflecting the cool and windy conditions experienced across the region in the winter months. These activities appear to be focussed on major waterbodies such as Lake George and Lake Bathurst.

Previous studies demonstrate that the archaeological record of the region is dominated by isolated and/or low density stone artefacts, reflecting the transitory use of the region. These are often focussed along water courses, and on high ground with view-lines – typically in protected areas away from major wind flow. There is some potential for deeper alluvial and/or colluvial deposits to be present containing cultural materials, but investigations of these types of sites is rare.

With specific reference to the development footprint, there is currently no documented evidence of cultural materials. A study of the adjacent Woodlawn Wind Farm undertaken in 2004 and 2010 identified a small number of stone artefacts – none of these are in close proximity to the development footprint (Biosis 2004, 2010).

A review of Heritage NSW's Aboriginal Heritage Information Management System (AHIMS) database identified 102 Aboriginal sites within 400 km^2 of the project, these are shown in Figure 8.28. These were similarly dominated by sites of varying densities of stone artefacts (89%), mostly isolated artefacts (31%), with the only other site type identified being sensitive landforms considered to be areas of potential archaeological deposit (PAD) (11%). No AHIMS sites are located within the development footprint, with the nearest being >1 km south of the encapsulation cell.

Since 2010, six Aboriginal Heritage Impact Permits (AHIPs) have been issued in the Goulburn-Mulwaree LGA. None encompass the development footprint.

8.11.4 Potential impacts

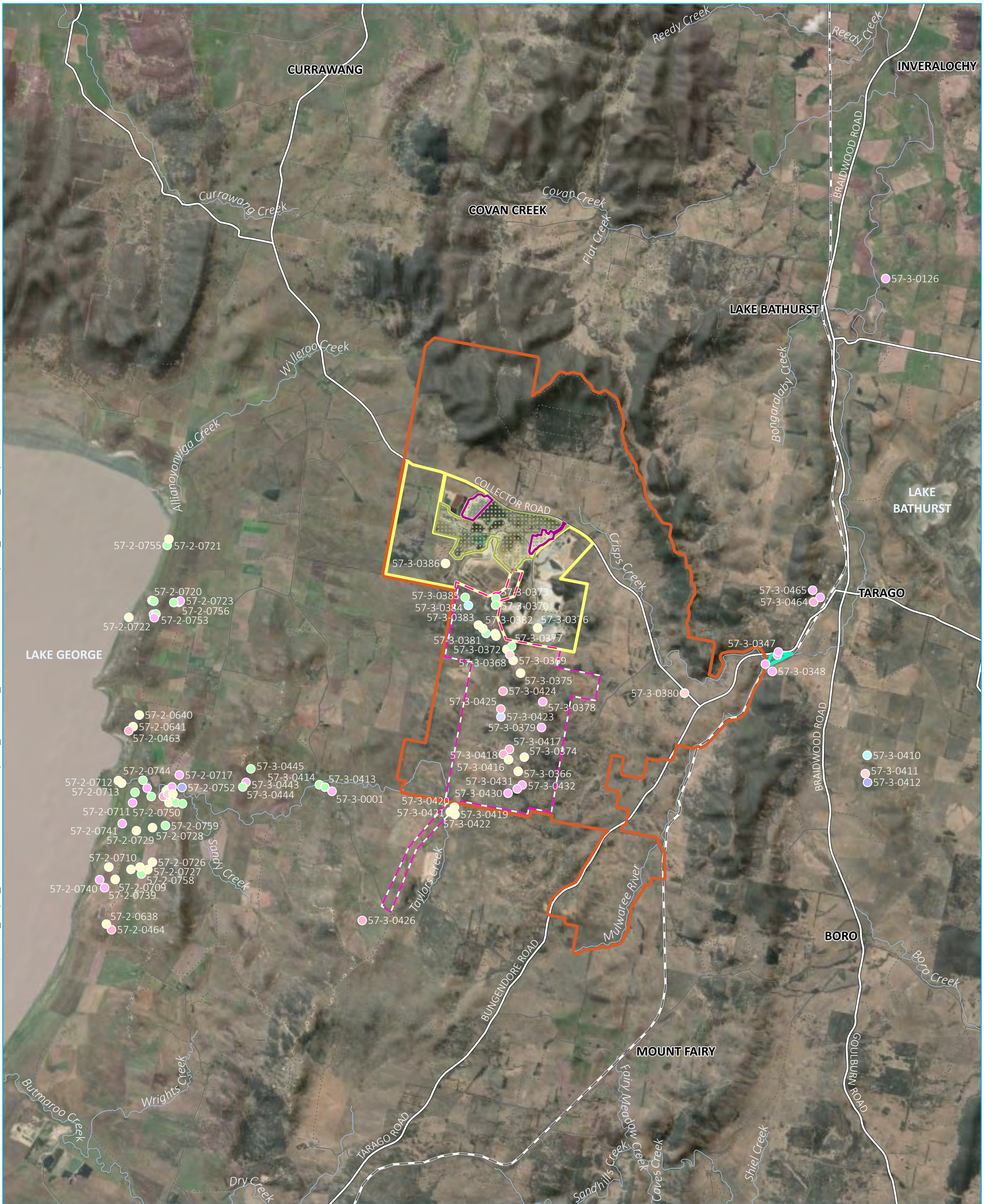
Conceptual design indicates that construction activities and earthworks within the development footprint will remove the upper portion (>1 m) of the soil profile currently present at the development footprint. Based on the regional data available, this is identified as the zone within which cultural material is typically found.

No Aboriginal objects, places or deposits were identified within the development footprint. Further, the potential for cultural materials is considered unlikely given the historical and modern activities that have occurred within the development footprint. Specifically, the last 50 years have seen the establishment of a mining operation followed by the Eco Precinct. This previous activity would have resulted in substantial earthworks and remediation to a considerable portion of the natural soil profile, probably several metres, and therefore would have impacted and/or destroyed cultural materials if ever present.

In the case of the development footprint, the encapsulation cell is proposed to be within an existing artificially created evaporation dam that has been excavated at least 2 m below the natural ground surface. The ARC similarly appears to be a benched platform cut into the surrounding slopes, and is probably 1–2 m below the original ground surface. While a detailed field survey was not feasible due to COVID-related travel restrictions, a brief site inspection on 2 June 2021 validated many of these desktop observations. Specifically, that the development footprint exhibited no evidence of pre-European landscapes or areas where they may be expected. A study undertaken in 1998 of the development footprint by Navin Officer Heritage Consultants reached similar conclusions.

The project is within a broader cultural landscape that encompasses important cultural places such as Lake George and Lake Bathurst. However, the project is not in close proximity, nor within sight, of these places. Furthermore, the development footprint is already within a heavily industrial location, and would be utilising existing disturbed areas; and therefore will not increase any impact into the natural unmodified environment surrounding the Eco Precinct.

No cultural materials have been identified within the development footprint, nor are expected to occur. No site-specific intangible or cultural values were identified during the ACHA process, and the proposed works would therefore be unlikely to impact such places based on current evidence. As such, it is considered that there would be no impacts to Aboriginal heritage.



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Source: EMM (2022); Veolia (2022); OEH (2021); DFSI (2017)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse

AHIMS site

- Artefact site (2-10)
- Artefact site (11-20)
- Artefact site (21-45)
- Artefact site (>45)
- Artefact site (unspecified)
- Isolated find
- Isolated find, PAD
- PAD

Previous documented Aboriginal artefacts and sites within the AHIMS database

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.28

EMM
creating opportunities

8.11.5 Management measures

Results of the investigations undertaken by the ACHA indicate there is no requirement for the preparation of an Aboriginal Heritage Impact Permit (AHIP) for the project to be assessed against Division 4.7 of the EP&A Act.

Recommendations below include the development of an Aboriginal Cultural Heritage Management Plan (ACHMP) to provide the post-approval management framework for all future Aboriginal heritage requirements for the project. They further outline the specific mitigation measures that should be implemented prior to, during and after the development. These are relatively minor, since no cultural materials were identified, however they do specifically include the requirement of registered Aboriginal parties being afforded an opportunity to inspect the development footprint and to get on Country, which was a key outcome of consultation to date. More generally, the recommendations include measures to ensure the continuation of Aboriginal consultation and engagement, appropriate documentation of the works to date, unexpected finds protocols, and lodging the ACHA with appropriate public repositories.

As noted in Section 8.11.4, a small portion of unmodified grassland is located immediately north of the encapsulation cell location and which is considered to have some potential for cultural material to have survived (if present). However, no activities are proposed in this locale.

The ACHMP will include the following measures:

- Prior to ground disturbance, an ACHMP must be developed by a heritage specialist in consultation with the Aboriginal stakeholders and consent authority to provide the post-approval framework for managing Aboriginal heritage within the development footprint. The ACHMP should include the following aspects:
    - Process, timing, and communication methods for maintaining Aboriginal community consultation and participation through the remainder of the project.
    - Process, timing and methods for the RAPs to visit the development footprint before any development activities are initiated, identify any cultural concerns and further discuss any mitigation measures that may be required for the project.
    - Descriptions and methods of any additional investigative and/or mitigative archaeological actions that may be required, prior to works commencing or during the project. These may include cultural inductions for all personnel and subcontractors outlining the past history and sensitivity of the region, archival recording, archaeological field survey, excavation and/or cultural monitoring for any areas where the surface impacts of the project intersect the identified Aboriginal objects and/or sites, and/or areas of archaeological sensitivity (specifically as presented in Figure 7.1 of the ACHA), and any additional requirements identified by the Aboriginal community.
    - Description and methods of post-excavation analysis and reporting of any archaeological investigations and activities implemented as part of the ACHMP. For excavations, these should include suitable collection and processing of stone artefacts, and chronological, soil, and environmental samples.
    - Description and methods for undertaking further Aboriginal heritage assessment, investigation and mitigation of any areas of the development footprint that have changed following completion of the Aboriginal heritage assessment and/or during the final design and construction phases of the project.
    - Procedures for managing the unexpected discovery of Aboriginal objects, sites and/or human remains during the project.

- Procedures for the curation and long-term management of cultural materials recovered as part of the works outlined in the ACHMP and any preceding stages associated with the project.
- Processes for reviewing, monitoring, and updating the AHMP as the project progresses.

- The Construction Environment Management Plan (CEMP), or equivalent, should reinforce how the cultural landscape is considered throughout the project and detail the rehabilitation of the development footprint. This should be undertaken in consultation with the RAPs.
- Consultation should be maintained with the RAPs during the finalisation of the assessment process and throughout the construction phase of the project. Details for how this consultation should be undertaken will be outlined in the ACHMP.
- A copy of the ACHA should be lodged with AHIMS and provided to each of the RAPs.
- Where the heritage consultant changes through the project, suitable hand over should occur to minimise loss or mistranslation of the intent of the information, findings and future steps in heritage management.

Table 8.44 Aboriginal cultural heritage management and mitigation measures

Impact/risk	ID	Measure	Timing
Ground disturbance	ACH1	The ACHMP must be developed by a heritage specialist in consultation with the Aboriginal stakeholders and consent authority to provide the post-approval framework for managing Aboriginal heritage within the development footprint. A copy of the ACHA should be lodged with AHIMS and provided to each of the RAPs.	Construction and operation
Rehabilitation	ACH2	Reinforcement of cultural landscape consideration throughout the project and detail the rehabilitation of the development footprint. This should be undertaken in consultation with the RAPs.	Construction and operation

8.12 Historic heritage

8.12.1 Introduction

A historical archaeological assessment was prepared by EMM to support this EIS and can be found in Appendix AA. The historical archaeological assessment (HAA) aimed to investigate any archaeological potential, including built heritage items of historical heritage significance related to European occupation. The HAA included a high-level desktop investigation of the project to capture potential historical constraints and provided recommendations and management measures for the project.

The HAA was prepared in accordance with the principles of:

- the *Australian International Council on Monuments and Sites, Charter for Places of Cultural Significance* (also known as the Burra Charter), (ICOMOS (Australia) 2013); and
- the *New South Wales* (NSW) *Heritage Manual* (NSW Heritage Office and NSW Department of Urban Affairs and Planning 1996) with particular attention to:
  - *Assessing Heritage Significance* (NSW Heritage Office 2001);
  - *Statements of Heritage Impact* (NSW Heritage Office 2002);

- *Investigating Heritage Significance* (NSW Heritage Office 2004); and
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch 2009).

The SEARs did not provide requirements for the assessment of historical heritage, with the following advice being provided by the Heritage Council of NSW:

> Thank you for your referral dated 3 June 2021 inviting SEARs input from the Heritage Council of NSW on the above State Significant Development proposal. The subject site is not listed on the State Heritage Register (SHR), nor is it in the immediate vicinity of any SHR items. Further, the site does not contain any known historical archaeological relics. Therefore, no heritage comments are required. The Department does not need to refer subsequent stages of this proposal to the Heritage Council of NSW.

The Goulburn Mulwaree Council (Council) requested a due diligence assessment to be prepared. The HAA fulfills the requirement provided by the Council.

8.12.2 Existing environment

i Land use and disturbance

The Eco Precinct was initially used for pastoral purposes. In 1978, the majority of the Eco Precinct, including the development footprint, was heavily disturbed by open cut mining operations, and later the development of the Bioreactor and associated waste management infrastructure. The Eco Precinct has been subject to various levels of activity from the construction of ancillary activities, roads, services, storage areas, multiple reservoirs, buildings, and natural erosion through de-vegetation.

ii Site inspection

The site inspection undertaken on 2 June 2021, as part of the HAA identified that the development footprint was heavily disturbed, with evidence of modifications to the ground surface, including the remains of former mining activities and numerous activities associated with the existing landfill operations.

The ARC development footprint is located predominantly in an area previously utilised by mining operations. The HAA describes the existing environment as including defunct mining plant related structures (no historic heritage significance), earthworks, fill material, and remnant concrete slabs.

Existing infrastructure including roads, access tracks, and overhead transmission lines are identified as present and utilised as part of current site operations.

The encapsulation cell development footprint is identified as being within an area currently being utilised as an evaporation dam. The area is highly disturbed with the dam being described as entirely artificial.

The description of the areas outside of the development footprint indicates a disturbed landscape incorporating parts of the Eco Precinct water management system, evaporation dams, pastures, areas of landscaping, and native vegetation regrowth in previously disturbed areas.

iii Archaeological sensitivity

The HAA identified only a small area of undisturbed land at the northern end of the encapsulation cell evidenced by historical aerial photography from 1960 and a site inspection, which identified what appears to be a survey marker. The survey marker is not an official NSW Permanent Survey Mark (PSM), not appearing in the Survey Control Information Management System (SCIMS). The materials suggest the potential survey marker dates to the last 60 years (ie post-1960).

Archaeological resources are often protected if the land is covered over; however, the development footprint has been subject to excavation and disturbance that would remove any remnants of relics if any were present. There is low to no potential for archaeological values.

iv Built heritage sensitivity

No listed built heritage was identified within the development footprint. The majority of infrastructure related to mining operations has been removed, however some machinery and buildings remain on site. The HAA considered that the mining operations and machinery from the period is well documented, and the machinery that is remaining is incomplete. It was concluded there was no historical significance as the remnant infrastructure is not representative or rare in terms of mining operations for the area or period.

8.12.3 Potential impacts

No potential historical archaeological impacts were identified as part of the HAA. The level of excavation and disturbance which has previously occurred on site will have previously removed any remnants of relics prior to the proposed project. The HAA deemed the project has low to no potential for archaeological value.

There is no listed built heritage within the development footprint. Some residual machinery and buildings associated with the mining operations are retained within the development footprint. Two structures are extant that relate to this period of the site's history, a two-storey structure and two single storey sheds. A large proportion of the mining infrastructure has been removed, leaving the concrete footprints and some demolition rubble. These buildings and concrete relate to the 1970s mining operation and the mining operations and machinery from this period are well understood and documented. The machinery is not complete, operable or within its original location. The machinery is therefore not representative and does not hold historical significance. Structures within the area relate to the operations of Veolia and have been constructed within the last 20 years.

The project was assessed against the NSW heritage assessment criteria to evaluate potential historical heritage significance of the project and determine any potential for impact on any items of significance. Table 8.45 below demonstrates that the project does not fit the criteria for a heritage site and will not impact any items of heritage significance.

Table 8.45 Assessment of the development footprint against the NSW heritage assessment criteria

Criterion	Explanation
a) An item is important in the course or pattern of NSW's (or the local area's) cultural or natural history (Historical Significance).	The site was a small grant to Francis Kenny, part of his broader landholdings. The grant was leased and then sold and used for pastoral purposes until the opening of the mine in the 1970s. It fits within the narrative of the granting of land in the region but is not a good example.
b) An item has strong or special association with the life or works of a person, or group of persons of importance in NSW's (or the local area's) cultural or natural history (Associative Significance).	Francis Kenny and the Cooper Brothers were locally well-known during his occupation of the area, but their notoriety was short-lived. The site is not associated with a person of note and does not hold significance under this criterion.
c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area) (Aesthetic Significance).	The site does not hold aesthetic or technical significance and is not significant under this criterion.

Table 8.45 Assessment of the development footprint against the NSW heritage assessment criteria

Criterion	Explanation
d) An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons (Social Significance).	The site may hold some significance to the local community as a source of employment by the mine. However, this is not considered to be a historical connection. The site is not significant under this criterion.
e) An item has the potential to yield information that will contribute to an understanding of NSW's (or the local area's) cultural or natural history (Research Significance).	No areas of archaeological potential have been identified on the site. The site is not significant under this criterion.
f) An item possesses uncommon, rare or endangered aspects of NSW's (or the local area's) cultural or natural history (Rarity).	There are other mines regionally and across the state of a similar scale and history. The site is not considered to be rare.
g) An item is important in demonstrating the principal characteristics of a class of NSW's (or the local area's) cultural or natural places or environments (Representativeness).	There are other mines regionally and across the state of a similar scale and history. The site is not considered to be representative.

8.12.4 Management measures

The results of the HAA and the impacts of the project indicate that the risk of disturbing relics is low and no built heritage exists within the development footprint. An additional heritage assessment is not required as the area has been assessed to be of low archaeological potential and the works will be carried out on previously disturbed ground. The mining related machinery holds no historical significance and may be removed.

The management and mitigation measures are summarised in Table 8.46.

Table 8.46 Historical archaeological heritage management and mitigation measures

Impact/risk	ID	Measure	Timing
Unexpected finds and skeletal remains	HER1	The Construction Environmental Management Plan (CEMP) to include an unexpected finds protocol that also addresses the unexpected discovery of skeletal remains.	Construction and operation
Unexpected finds protocol	HER2	If unexpected finds of a historical nature are discovered during any work, work must cease within 5 m of the find and the following steps taken: • follow an unexpected finds protocol not limited to: – no further harm to the object; – secure the area to avoid further harm to the object; and – contact an archaeologist for further advice. In the event that known or suspected human remains (generally in skeletal form) are encountered during the activity, the following procedure will be followed immediately upon discovery: • all work in the immediate vicinity will cease and the find will be immediately reported to the work supervisor who will advise the Environment Manager or other nominated senior staff member; • the Environment Manager or other nominated senior staff member will promptly notify the police (as required for all human remains discoveries); • the Environment Manager or other nominated senior staff member will contact Heritage NSW for advice on identification of the human remains; • if it is determined that the human remains are Aboriginal ancestral remains, the Local Aboriginal Land Council (LALC), and other registered Aboriginal parties will be contacted, and consultative arrangements will be made to discuss ongoing care of the remains; and • if it is determined that the human remains are not Aboriginal ancestral remains, further investigation will be conducted to determine if the remains represent an historical grave or if police involvement is required.	Construction and operation
Potential survey marker	HER3	The potential survey marker should be avoided. If impacts cannot be avoided, an archival recording should be undertaken prior to removal. Consultation should be undertaken with the NSW Registrar General to ensure it is not a statutory survey marker.	Construction and operation

8.13 Visual

8.13.1 Introduction

The landscape and visual impact assessment (LVIA) has been prepared by Green Bean Design Landscape Architects (Green Bean Architects) and is provided in Appendix BB. The LVIA was prepared with reference to relevant guidelines and policies, as outlined in Section 2.1 of the LVIA. The relevant SEARs and how they are addressed, are summarised in Appendix A and Section 1.2 of the LVIA (Appendix BB). A summary of the existing environment, impact assessment and mitigation measures is provided below.

8.13.2 Existing environment

i Surrounding land uses

The development footprint is part of Veolia's integrated waste management operations. The Woodlawn Mine surface infrastructure area is immediately to the east of the ARC. Veolia's landholdings, including the broader Eco Precinct area including the Pylara Farm provide a buffer between operations and surrounding private properties. The development footprint has been subject to disturbance associated with historic mining operations and integrated waste management operations.

ii Key site features

Topographically the development footprint is identified as being level to gently inclined and significantly altered by previous industrial land uses. More broadly, the Eco Precinct extends across generally level to gently sloping land south of the Collector Road corridor. The land rises from east to west around 10 m over a distance of 2 km.

Landform to the south of the ARC is primarily associated with the Woodlawn Bioreactor site with elevated land surrounding the main void of the former mining operations. Land surrounding the void has been rehabilitated with battered slopes partially vegetated. The overall structure of the landscape is simple within the Eco Precinct with stronger topographical elements including elevated ridgelines beyond the Eco Precinct. The overall scale of the landscape is moderate to large with low hills and ridgelines constraining opportunities for long range views through the landscape and beyond the Eco Precinct.

Landcover is largely simple and regular across the Eco Precinct ranging between mined and rehabilitated areas, disturbed ground and constructed water bodies which contrast with broader pasture landscape extending south-west and west toward Lake George. Areas of scattered tree cover across low rolling hills within the wind farm precinct contrast with areas of denser tree cover along steeper slopes and ridgelines of the Great Dividing Range.

Specific characteristics and features that occur within the surrounding landscape include:

- landscape associated with the Great Dividing Range (timbered slopes and ridges);
- grassland and pasture;
- Lake George;
- Collector Road corridor; and
- industrial landscapes (Eco Precinct, Woodlawn Mine and Woodlawn Wind Farm).

iii Receiver locations

Settlement is generally dispersed throughout the surrounding landscape and consists largely of farms and associated dwellings (ie rural dwellings). Movement is generally restricted to local vehicular movements, including cars and trucks travelling along Collector Road and Taylors Creek Road, and other minor roads and access tracks. Occasional agricultural vehicles are seen within fields, with movement and activity expected to be greater during more intense farming periods.

The viewpoints from the following rural dwellings, local roads and areas are considered in the LVIA and shown in Figure 8.29:

- D28 rural dwelling;
- D53 rural dwelling;
- D168 rural dwelling;
- D176 rural dwelling;
- D180 rural dwelling;
- D186 rural dwelling;
- D187 rural dwelling;
- D188 rural dwelling;
- Collector Road (north of the development footprint);
- Taylors Creek Road;
- Kevin Wheatley VC Rest Area;
- Weereewa Lookout;
- Federal Highway; and
- Tarago locality.

For the purpose of assessing visual impacts, a viewshed is defined as the area of land surrounding the project which could be affected by project related infrastructure, including the proposed ARC building, the IBA area and the encapsulation cell. The viewshed analysis, including view corridors, ridgelines and viewpoints are shown in Figure 8.29. The extent of visibility of the project from the surrounding area is illustrated in Figure 8.30.

The immediate viewshed (generally within 2 km of the ARC) would be limited to views from the Collector Road corridor. Receiver locations with a view toward the ARC within the immediate viewshed would be largely confined to motorists experiencing short duration views toward the ARC from Collector Road. Views would extend toward the ARC building and the encapsulation cell from short sections of the road corridor; however, views would be short term and generally indirect to the direction of travel. Views toward the ARC building would also be disrupted by tree cover alongside the road corridor and bounding the mining operations to the east of the ARC building. The immediate viewshed would also be disrupted by gently undulating landforms below distinct ridgelines creating dips and crests along the Collector Road corridor, as illustrated in Figure 8.21.

The broader viewshed would be limited by rising landform and ridgelines to the north, northwest, east and southeast of the Eco Precinct, with the Great Dividing Range extending through elevations at around 900 m AHD to 1,000 m AHD as illustrated in Figure 8.30.

More distant views would also be influenced by lower undulating landforms (between 700 m AHD to 800 m AHD, as illustrated in Figure 8.30, including landforms along the Woodlawn Wind Farm, and across the Capital Wind Farm east of Lake George and south of the Eco Precinct. Distant views (including those more than 15 km) toward project infrastructure from lookout points (rest areas) along the Federal Highway would tend to be screened by landform, as would views from vehicles travelling along the Federal Highway. Views from elevated viewpoints along the Federal Highway, including the Weereewa Lookout may extend toward portions of the ARC building and the encapsulation cell; however, at around 19 km view distance any visible elements would be indistinct and unlikely to be viewed as dominant features within the available viewshed.

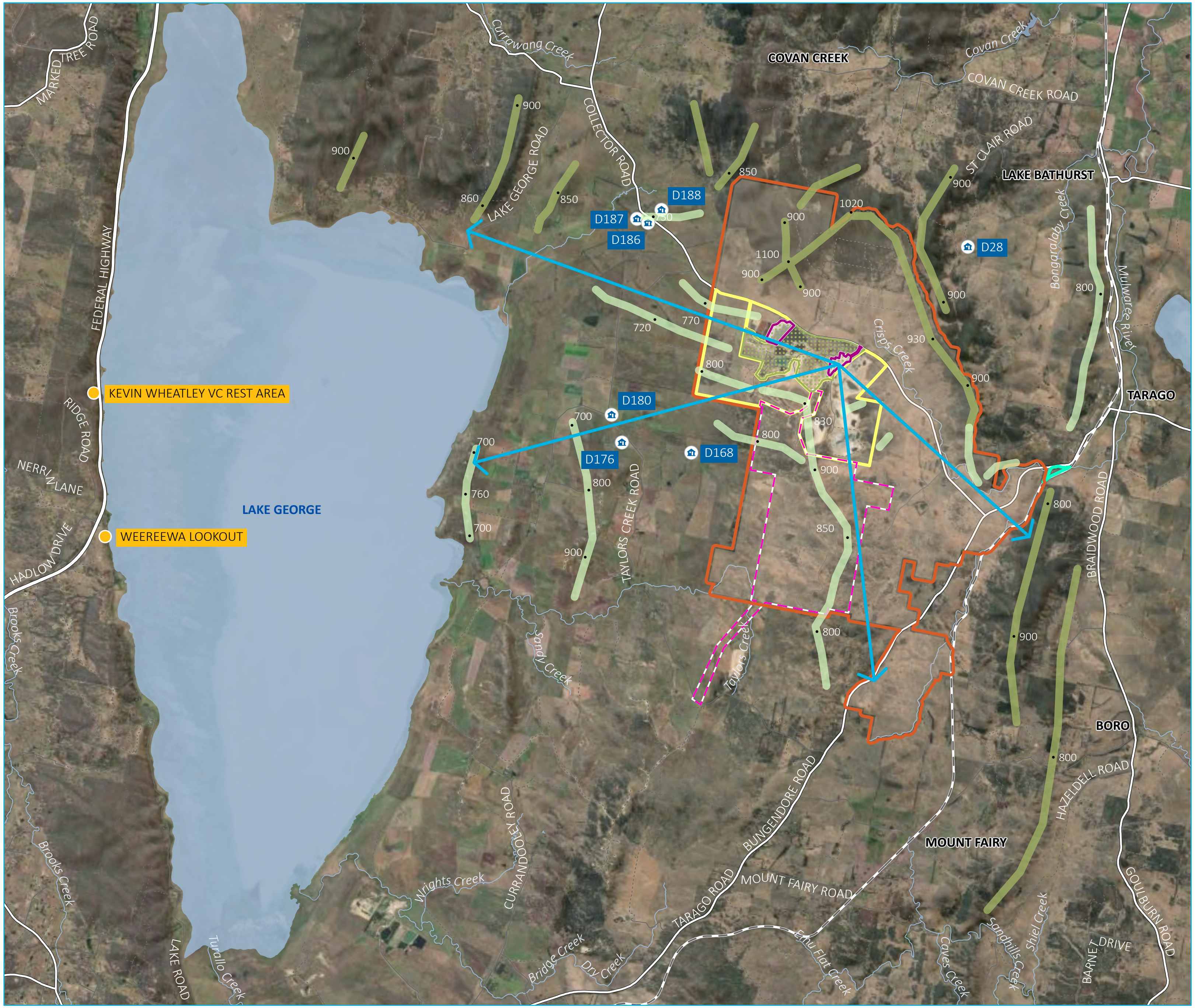
iv Photographs

A series of individual and panorama digital photographs and aerial images were taken during the site inspection undertaken for the LVIA, to illustrate existing views near the Eco Precinct and to give a sense of the ARC in its setting. Photographs were taken from different aspects surrounding the ARC, in consideration of different views surrounding the Eco Precinct, which could be affected by ARC infrastructure, including the proposed ARC building (roof height of 54 m above ground level), stack (85 m above ground level) and encapsulation cell final landform (30 m above ground level).

Some of these photographs are shown in Photograph 8.1 – Photograph 8.5, and show views from the following locations:

- Collector and Taylors Creek Roads intersection, which is located north-west of the ARC;
- Lumley Road, Targo, which is located east of the ARC;
- locations from Collector Road, and from both east and west sides of the ARC.

All photographs taken are shown in Section 5 of the LVIA, and also include photographs from the western side of Lake George (P9 and P10) south-eastern (P6), south-western (P2) and southern aspect (P7 and P8), which are further away from the ARC than the photographs taken below. For the most part, the views of the Eco Precinct and ARC from the western side of Lake George, south-west, south and south-east are obstructed by landform.



Source: EMM (2022); Veolia (2022); DFSI (2017)

Visual impact assessment viewpoints

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.29

EMM creating opportunities

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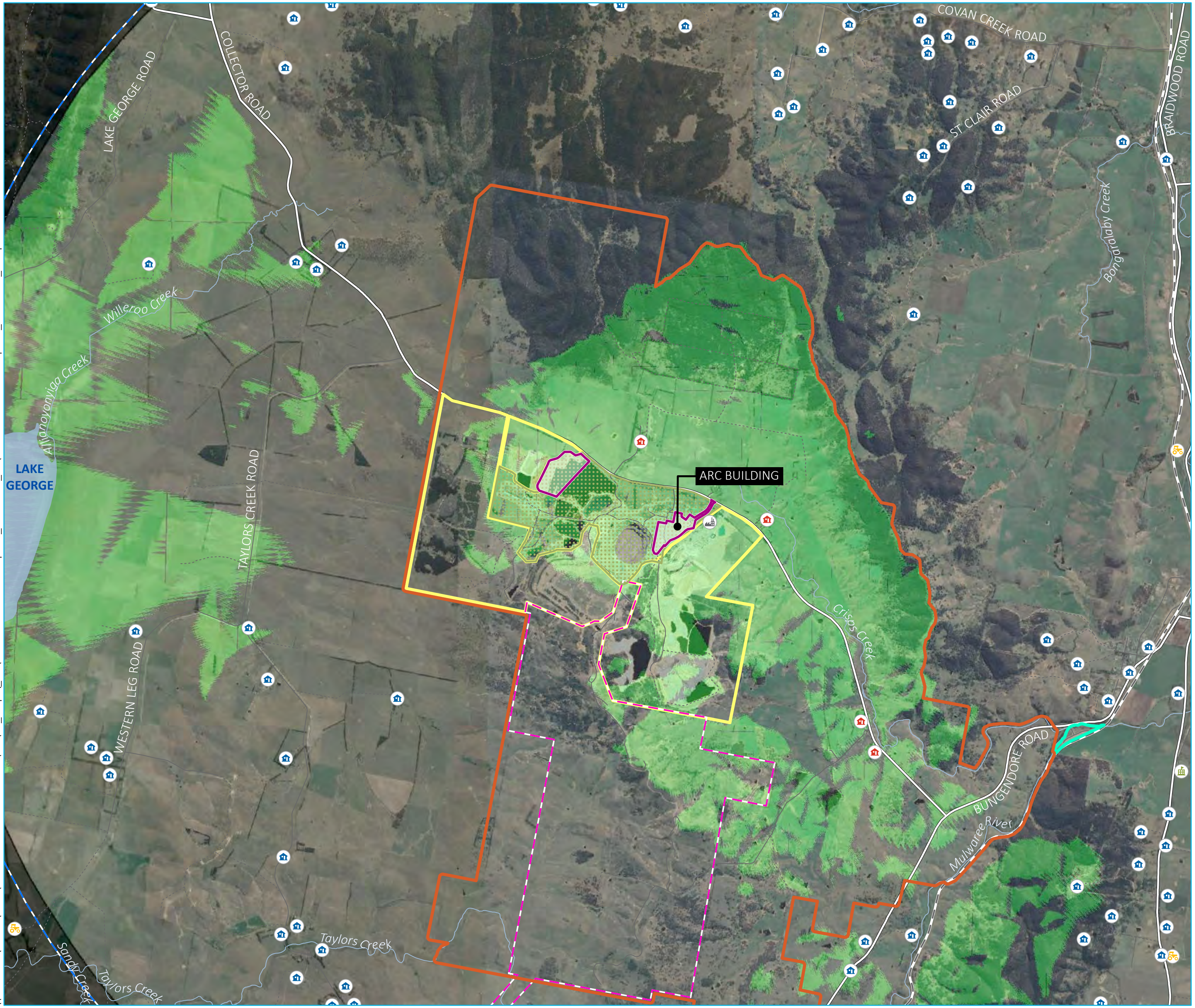

KEY

- Development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- ARC building 10 km buffer
- Indicative visibility toward ARC building top of stack (around 864.3 m AHD)
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse
- Named waterbody

Assessment location

- Agriculture
- Community/school
- Industrial
- Residential
- Veolia

Note: Indicative visibility is modelled against landform and does not account for the potential screening effect of vegetation or built structures which may also screen or filter views toward the ARC.

Extent of visibility of the project from the surrounding area

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.30

0 1 2 km
GDA 1994 MGA Zone 55

N

Source: EMM (2022); Veolia (2022); DFSI (2017)

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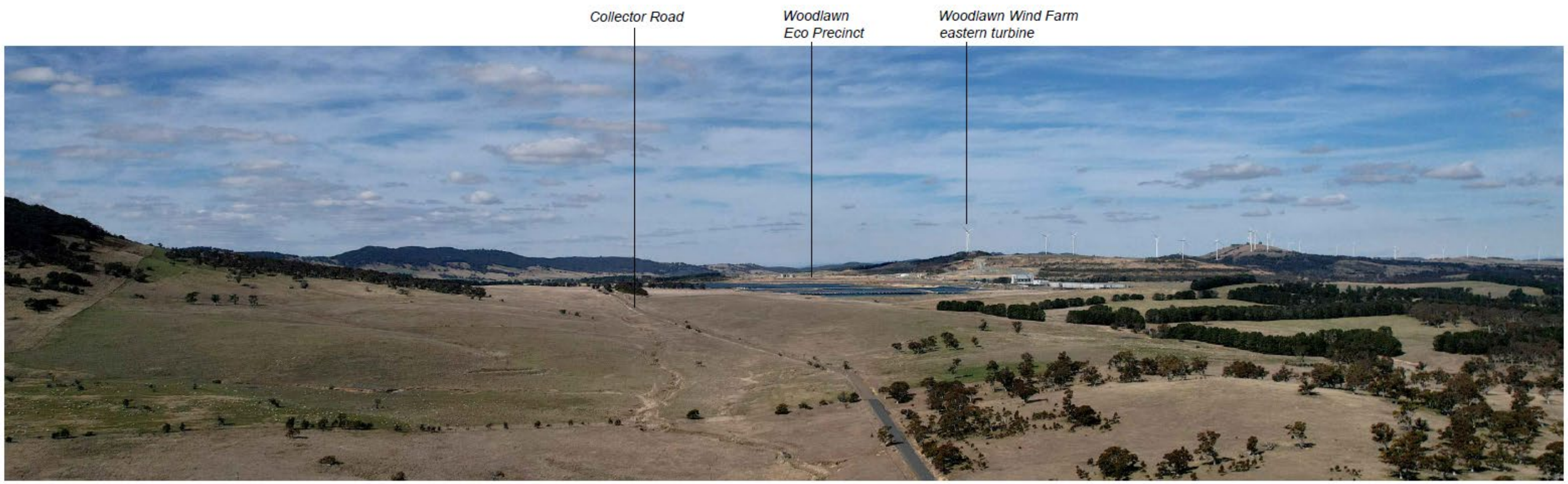
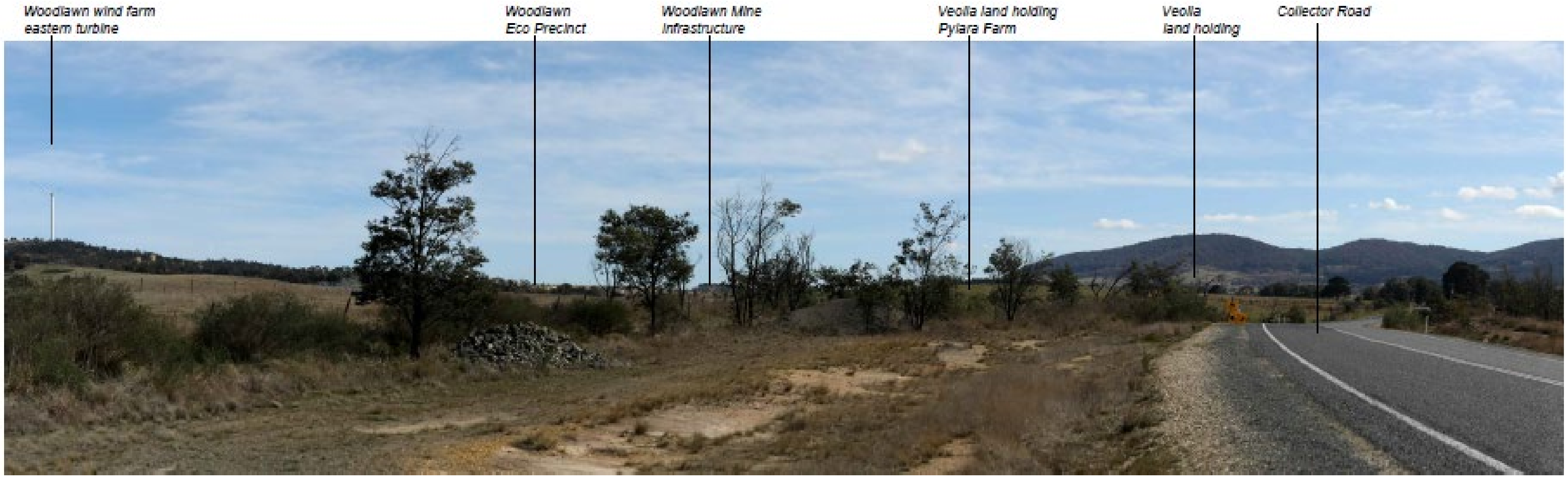
EMM creating opportunities



Photograph 8.1 **A2 Aerial photo view east to south-west above Collector Road toward the Eco Precinct**

Photograph 8.2 **P1 Lumley Road, Tarago. View north-west with views toward the Eco Precinct site blocked by landform**



Photograph 8.3 P3 Collector Road. View north-west toward the Eco Precinct partially screened by landform and scattered tree cover

Photograph 8.4 P4 Collector Road. View south-west toward the Eco Precinct and proposed ARC building location

Photograph 8.5 P5 Collector Road. View south-west to south-east toward the Eco Precinct.

8.13.3 Potential impacts

i Landscape character assessment

For the purpose of the LVIA, the landscape character surrounding the Eco Precinct has been determined as a singular landscape unit which generally occurs within a 10 km viewshed of the Eco Precinct. The landscape unit represents an area that is relatively consistent and recognisable in terms of its key landscape elements and physical attributes which include a relatively limited combination of topography/landform, vegetation/landcover, land use and built structures.

The LVIA assessed overall landscape sensitivity for the landscape unit, and determined whether the impacts were either negligible, low, medium or high and on a scale between 1–30 as defined in Table 8.47.

Table 8.47 Visual sensitivity categories

Category	Scale	Definition
Negligible	Up to 6	The characteristics of the landscape area would not be impacted or visibly altered by the ARC.
Low	7 to 14	Most of the landscape character area characteristics are generally robust and would be less affected by the ARC. The degree to which the landscape may accommodate the ARC would not significantly alter existing landscape character.
Medium	15 to 22	Distinguishable characteristics of the landscape character area may be altered by the ARC, although the landscape character area may have the capability to absorb some change. The degree to which the landscape character area may accommodate the ARC would potentially result in the introduction of prominent elements to the landscape character area but may be accommodated to some degree.
High	23 to 30	Key characteristics of the landscape character area would be impacted by the ARC and would result in major and visually dominant alterations to perceived characteristics of the landscape character area which may not be fully mitigated by existing landscape elements and features. The degree to which the landscape may accommodate the ARC would result in several perceived uncharacteristic and significant changes.

The results of the landscape character assessment have identified that the landscape unit has an overall sensitivity rating scope between 14–30. In consideration of the existing landscape characteristics, the landscape within and surrounding the Eco Precinct has been determined to have a low sensitivity to the ARC building and the encapsulation cell. Most of the landscape character area characteristics are generally robust and would be less affected by the project. Thus, the LVIA concluded that the degree to which the landscape may accommodate the project would not significantly alter existing landscape character.

ii Visual impact assessment

a Overall visual project impacts

The LVIA considers the significance of visual impact that would result from the construction and operation of the project with regard to the *sensitivity* of the view and *magnitude* of the project in that view.

Visual sensitivity, as defined in Section 8.4 of the LVIA, refers to the quality of the existing view and how sensitive the view is to the proposed changes resulting from the project. Visual sensitivity is related to the direction of view and the composition of the view.

Visual magnitude, as defined in Section 8.5 of the LVIA, refers to the measurement of scale, form and character of the project when compared with the existing condition, as well as how far the proposal is from the viewer.

Following selection, the viewpoints listed in Section 8.13.2 have been rated as to their sensitivity and magnitude to change by the project in consideration of aspects identified in Table 8 and Table 9 of the LVIA (Appendix BB). As final sensitivity and magnitude grading were assessed against each receiver viewpoint to derive at the overall visual impact of each location.

A composite visual impact grading has been determined for each receiver viewpoint by reference to the visual impact grading provided in Table 8.48.

Table 8.48 Proposed visual impact grading matrix

Magnitude					
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High impact	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

The results of the visual impact assessment are provided in the LVIA (Appendix BB), and conclude the following:

- one of the thirteen receiver viewpoints would likely experience a moderate to low visual impact (ie Collector Road (north of the development footprint)); and
- twelve of the thirteen receiver viewpoints would likely experience a negligible visual impact.

Collector Road (incorporating views from north of the development footprint) has been determined to have an overall moderate-low visual impact with regard to the ARC building and encapsulation cell. These sections of Collector Road represent the closest point along Collector Road to each of these project elements, respectively. Whilst determined as a moderate-low impact, it is noted that:

- views toward both sites would predominantly occur from moving vehicles (for less than 15 seconds) and would be indirect to the direction travel; and
- opportunities to gain views toward the ARC building and encapsulation cell would be further interrupted and/or limited by tree screening along the majority of the Collector Road corridor.

To illustrate the views from Collector Road, two photomontages have been prepared to illustrate the ARC building, and the encapsulation cell at year 25 (ie the final landform). These are shown in Figure 8.31 and Figure 8.32, respectively.

All dwelling receiver viewpoints, as well as the Tarago locality, have been determined to have an overall negligible visual impact with regard to the ARC building and encapsulation cell. The negligible visual impact results from the screening and blocking effect of landform and tree cover between the receiver viewpoints and the Eco Precinct and project. At greater distances, such as from the Federal Highway and Weereewa Lookout, the ARC building and stack would form very small elements within the overall available view with the stack viewed against a backdrop existing wind turbines, vegetated hills and ridgelines and will not form a skyline object.

A plume from the ARC stack may be visible at certain times and may occur under weather conditions where water vapour condenses resulting in a visible white or light grey plume. The weather conditions include cold and clear conditions (occurring mainly at night) as well as days with high relative humidity (ie wet and damp weather). A plume would not result in significant visual impacts, with plume height and duration of visibility subject to prevailing weather conditions. Other plumes not related to the ARC may also be visible in the landscape at certain times of year, including those associated with wood burning stoves from dwellings.

Receiver viewpoints including the Federal Highway, the Kevin Wheatley VC rest area and the Weereewa Lookout have been determined to have a negligible visual impact. The negligible visual impact results from the view distance of between 16 km and 19 km toward the ARC building and the encapsulation cell. Elements within these works would not be generally distinguishable from the surrounding landscape, or where visible would not be dominant visual elements in the view.

b Construction

Whist construction activities would tend to be more visible than the operational stage of the ARC building, the construction activities would be temporary and transient in nature. Views toward construction activities would be partially restricted by landform existing tree cover surrounding the Eco Precinct.

The encapsulation cell would be constructed in a staged approach over an anticipated 25 year design life. The staging would include development in four major cells located within the western extent of ED1. Stage 1 of the encapsulation cell would be at the furthest extent from Collector Road, with the encapsulation cell stages being developed in a south to north direction. The encapsulation cell would be located in a visually constrained location where ongoing works would be largely restricted to indirect and very short-term (less than 15 seconds) from around 250 m of the road corridor.

c Night-time lighting

The project would require installation of lighting for operational, safety, security and maintenance purposes. Night lighting would include building and pole mounted directional spot lighting, pole mounted pedestrian/car park lighting and potentially diffuse lighting though translucent panels. The ARC building would avoid broad area of floodlighting where possible. Light installations would be installed in accordance with the Australian Standard *Control of the obtrusive effects of outdoor lighting* (AS 4282-2019) and avoid light spill to adjoining road corridors and residential areas. In summary, night-time lighting is not anticipated to have an adverse impact.

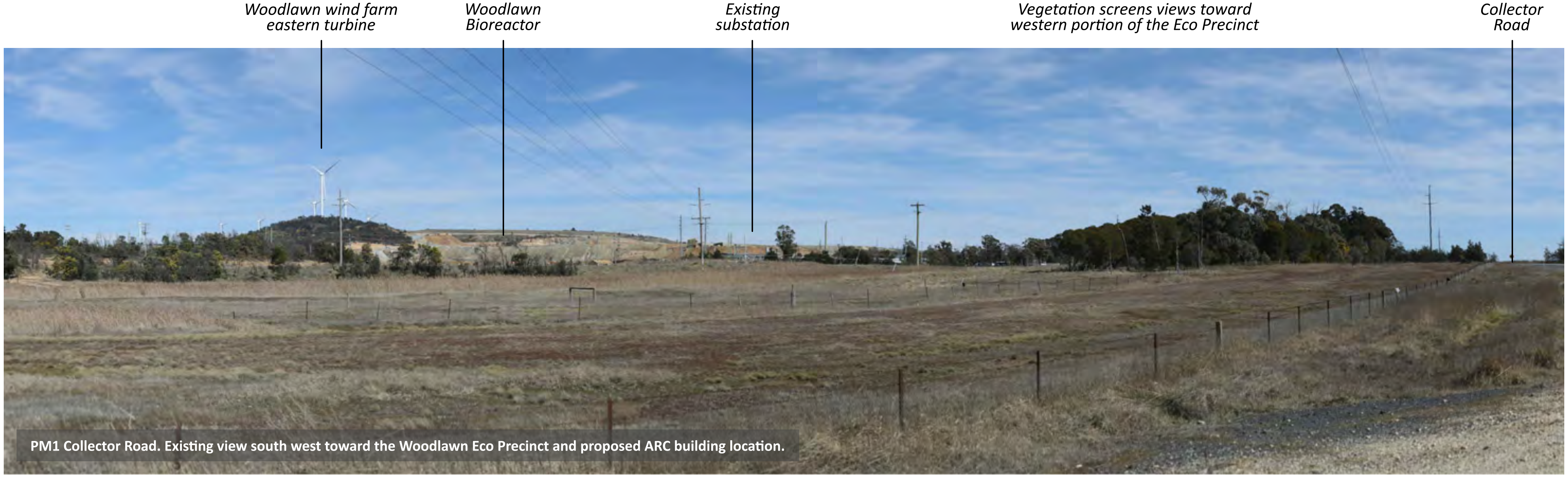
d Overshadowing

The location of the ARC building in relation to the offset distance to road corridors, would result in shadow cast by new infrastructure being largely contained within the Eco Precinct boundary. The ARC building will not create any cumulative shadowing in addition to existing infrastructure within the Eco Precinct boundary.

iii Cumulative visual impacts

A cumulative visual impact could result from elements of the ARC building being constructed in conjunction with other existing or proposed developments which could be either associated or separate to it. Separate developments could occur or be located within a local context where visibility is dependent on a journey between each site or within the ARC building viewshed.

The ARC building is considered to have limited potential to increase the significance of cumulative visual impact with regard to existing large scale visual elements, including wind turbines located within and beyond the Eco Precinct. This is largely due to visual screening surrounding the Eco Precinct for most receiver viewpoints as well as the location of project elements relative to existing infrastructure.



Imagery courtesy of GREEN BEAN DESIGN *landscape architects*

Figure 8.31 Photomontage – ARC

Imagery courtesy of GREEN BEAN DESIGN *landscape architects*

Figure 8.32 Photomontage – encapsulation cell

EMM creating opportunities

8.13.4 Management measures

i Overview

Mitigation measures should be considered to minimise the level of residual visual impacts during construction and operation. The mitigation measures generally involve reducing the extent of visual contrast between the visible portions of the ARC building structures and the surrounding landscape, and/or screening direct views toward the ARC building where possible.

ii Construction

Mitigation measures during construction should consider:

- minimise tree removal and/or protection of existing trees to be retained;
- avoidance of temporary light spill beyond the construction site where temporary lighting is required and rehabilitation of disturbed areas; and
- appropriate selection of plant material and size to replace existing plants to be removed or to create new plantings around the ARC building.

iii Operation

Mitigation measures during the operational period should consider:

- light installation to be designed and placed in accordance with AS 4282-2019, to minimise obtrusive effects;
- ongoing maintenance and repair of constructed elements;
- replacement of damaged or missing constructed elements; and
- long-term maintenance (and replacement as necessary) of tree planting within the Eco Precinct to maintain visual filtering and screening of external views.

8.14 Social

8.14.1 Introduction

A social impact assessment (SIA) was prepared by EMM and is provided in Appendix CC. The SIA was prepared in accordance with relevant SEARs and guidelines. A summary of the existing environment, impact assessment and mitigation measures is provided below.

i Assessment guidelines and requirements

The SIA was prepared in accordance with the *Social Impact Assessment Guideline for State Significant Projects* (SIA Guideline 2021) (DPIE 2021f) and the *Technical Supplement: Social Impact Assessment Guideline for State Significant Projects* (SIA Technical Supplement 2021) (DPIE 2021g). The SIA was also informed by best practice guidance and standards set out by the International Association for Impact Assessment (IAIA) and International Finance Corporation (IFC).

The relevant requirements of the SEARs and how they are addressed, are summarised in Appendix A and Section 3 of the SIA (Appendix CC).

ii Summary of assessment methods

a Method

The SIA adopted the approach and principles supported by both international and NSW best-practice guidance documents. The SIA addresses the social impacts and benefits of the project to the local area and the region. The broader state-wide benefits of the project, which relate to its alignment with NSW waste infrastructure needs and planning, and its economic impacts, are discussed in Chapter 3 and 9.

The SIA methodology comprised:

- Scoping and initiation – scoping for the project, which also involved Veolia understanding the purpose of preparing a SIA in accordance with the SIA Guideline 2021.
- Social baseline study – a social baseline study was prepared using demographic, health, housing, and socio-economic data from the Australian Bureau of Statistics (ABS), government agencies, and local government; published literature and social research; government policies and plans; and documents relating to similar resource projects. It should be noted that the baseline and study was prepared prior to the release of 2021 census data and therefore relies on data from the 2016 census.
- Field study – community consultation was conducted using social research methods, which included in-depth interviews to collect qualitative and quantitative data.
- Social impact identification – the findings of the social baseline, field study and EIS technical reports were considered along with local plans and policies to identify social impacts and benefits.
- Social risk assessment – each of the social impacts identified was assessed to predict the nature and scale of potential social impacts for the life of the project. A social risk approach was adopted to assess the consequences and likelihood of potential positive and negative social impacts with and without social mitigation measures.
- Social impact mitigation and management – a mitigation and management framework was prepared with consideration of potential social impacts and benefits.

b Social impact assessment study area

The SIA considers two key 'areas of social influence' (study areas) including a local study area and a regional study area, which are defined in Table 8.49. The areas that fall within the local and the regional study areas are presented in Figure 8.33.

Table 8.49 Study area

Study area	Geographic area	ABS data category	Referred to in report as
Local study area	Tarago suburb	Lake Bathurst Suburb Code	Local area
	Lake Bathurst suburb	Currawang Suburb Code	
	Currawang suburb	Mount Fairy Suburb Code	
	Mount Fairy suburb	Lake Bathurst Suburb Code	
Regional study area	Goulburn Mulwaree Council area	Goulburn Mulwaree LGA	Regional area
	Lake George suburb	Lake George Suburb Code	
	Bungendore suburb	Bungendore Suburb Code	
	Mulloon suburb	Mulloon Suburb Code	
	Bywong suburb	Bywong Suburb Code	
	Boro suburb	Boro Suburb Code	
	Manar suburb	Manar Suburb Code	
State of New South Wales	State of New South Wales	New South Wales STE	NSW

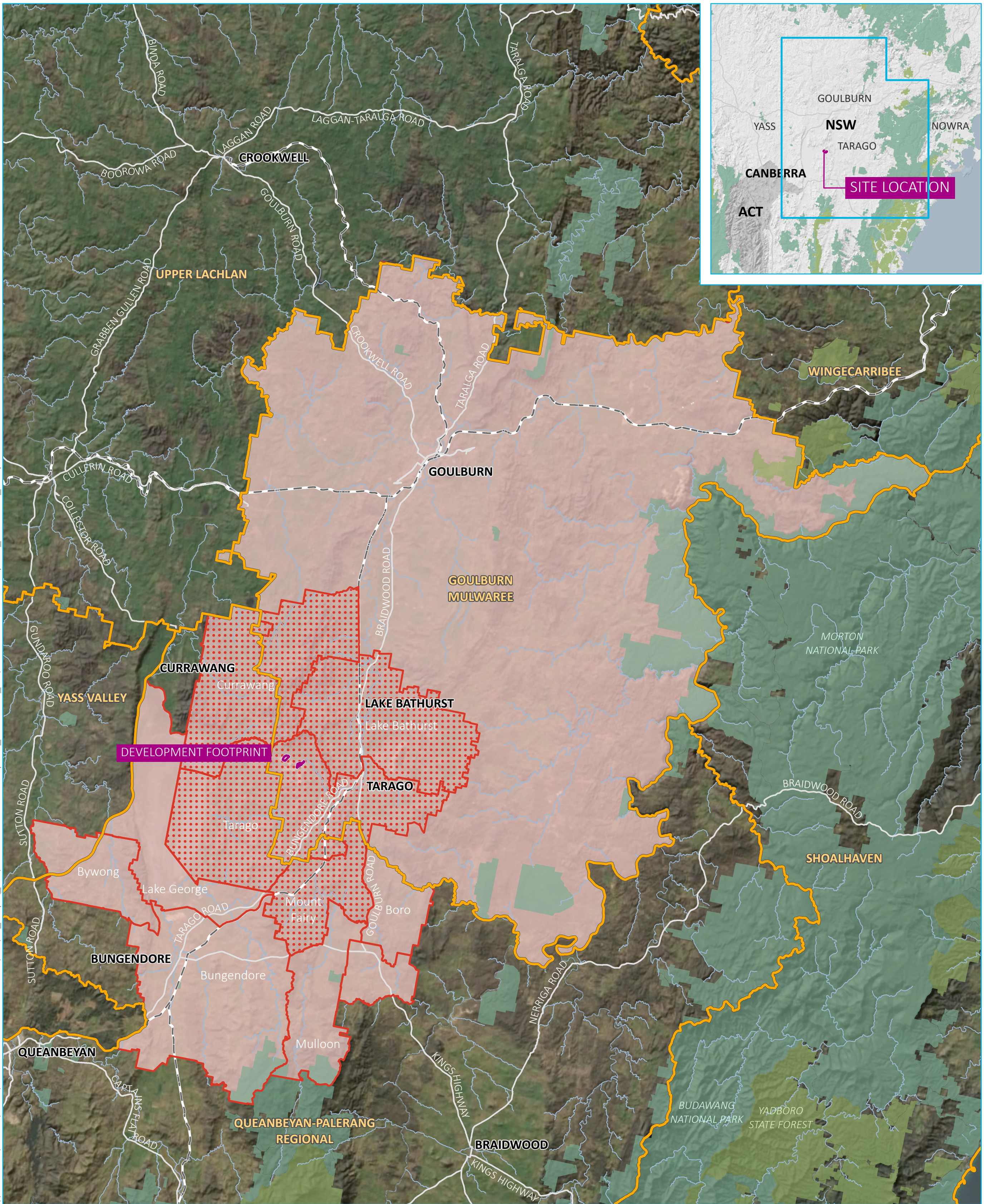
c Community and stakeholder engagement

A number of stakeholder engagement activities were undertaken throughout the assessment process. These activities included a range of social research and consultation methods, including semi-structured interviews and workshops, online survey, open days that provided opportunities to meet the project team and provide feedback, community brochures distributed throughout the local community, community information webinars, and project updates via the project website.

The SIA process adopted a case study approach which was focused on a deeper understanding of the potential impacts on individuals and groups that are interested in and/or will be potentially impacted by the project. The engagement undertaken for the SIA was separate to the broader stakeholder engagement for the project. It included a series of in-depth interviews with residents, workshops with service providers and an online survey. Given this, the findings summarised in the SIA and in the following sections are based on a small sample of residents and groups. Participants “opted in” to the SIA, and the sampling method and small size means the findings cannot be assumed to be representative of the broader local and regional community, they are an indication of the views of a group of individuals who chose to participate in the study.

All stakeholder engagement activities sought to gather feedback, perceptions of the project and to inform the project development process.

Overall, the community engagement findings identified values, strengths and vulnerabilities which offer an understanding of the community surrounding the project site. An overview of the most prominent community identified social values, strengths and vulnerabilities is provided in Table 4.3 of the SIA (Appendix CC) and incorporated into the summary of impacts in Section 8.14.3.



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Source: EMM (2022); Veolia (2022); DFSI (2017); ABS (2016)

0 10 20 km

GDA 1994 MGA Zone 55

N

KEY
- Development footprint
- Local area
- Regional area
- State suburb (ABS)
- Local government area
- Rail line
- Main road
- Watercourse
- Named waterbody
- NPWS reserve
- State forest

Social impact assessment study area

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 8.33

EMM
creating opportunities

8.14.2 Existing environment

A detailed social baseline study was undertaken as part of the SIA and is briefly summarised herein. Full details can be found in Appendix CC.

The local area, which includes the localities of Tarago, Lake Bathurst, Currawang and Mount Fairy, has a relatively small population size (1,041) compared to the region (35,768) (ABS 2016a), which may reflect the rural location with small villages and a limited number of services available. However, population trends from the available data of the regional area demonstrate an increasing population, with a 20.5% increase of the total population between 2006–2016. Population projections published by DPIE (2019) suggest that the projected population of Goulburn Mulwaree LGA is estimated to increase by 3,214 people from 2016–2041, representing a total change of 10.6% and an average annual growth rate of 0.4% (DPIE 2019). The growth projections are lower than those for NSW and may indicate a trend of rural to urban migration, which could be influenced by people seeking education or work opportunities not readily available in regional communities and enhanced across the community, social and health services (AIHW 2005; Hugo, & Harris 2011; D'Alessandro & Bassu 2015).

Anecdotal evidence has shown an increase in people moving to the Goulburn Mulwaree LGA due to the COVID pandemic, with Council noting an increased demand for subdivisions since the emergence of the pandemic (Pers comm, 2021). The effects of the pandemic on population flows are unknown and will need to be monitored.

Rates of homelessness in the LGA are much lower than NSW rates. However, the context of the pandemic creates additional risk of housing instability and homelessness for persons experiencing financial hardship. The pandemic has facilitated increased migration from urban centres to more regional and rural areas of Australia (Anglicare 2021, Goulburn Post 2021). This has contributed to increased rents and lower rental availability (particularly affordable housing) in regional areas of Australia, including the Goulburn Mulwaree area. There is a substantial undersupply of rental housing in the local and regional area.

Within the Goulburn Mulwaree LGA, the 2016 Socio-Economic Indexes for Areas (SEIFA) scores indicate that these areas experience a mid-range of socio-economic disadvantage and advantage, with rankings of 4–5 across each of the SEIFA indexes. This indicates that on average the population of the Goulburn Mulwaree LGA when compared to other LGAs within NSW will have higher education qualifications and be working in skilled occupations and have a more equal distribution of incomes, and higher home ownership.

The analysis has identified a low individual and household median weekly income ($625 and $1,196 respectively) in the regional area, specifically in the Goulburn Mulwaree LGA when compared to greater NSW ($664 and $1,486 respectively).

In the local area the analysis found higher SEIFA scores, indicating a more advantaged locality, with the top three occupations including managers (23.5%), technicians and trades workers (17.9%), and professionals (16.3%). The significant proportion of managers is likely attributed to the prevalence of agriculture, forestry and fishing industry throughout the local area.

The analysis also identified slightly poorer mental health outcomes in the region when compared to NSW. Furthermore, within the Southern NSW Local Health District (LHD), rates of alcohol consumption, smoking and obesity were reportedly higher than rates in NSW which suggest poorer physical health outcomes in the local and regional area.

The Goulburn Mulwaree community values their natural environment, bushland, parks, and rural landscapes, as well as its heritage and character, with many buildings dating to the late 1800s still standing and in use today, including the Post Office, the Gaol, Hospital and Kenmore Mental Hospital, among others (Goulburn Mulwaree Council 2020a; Goulburn Mulwaree Council 2020b).

The Queanbeyan-Palerang Regional Council values strong social and environmental connections between country and rural communities (Queanbeyan-Palerang Regional Council 2018). The community of the Queanbeyan-Palerang Regional Council is neighbourly, friendly, caring and inclusive and values the natural environment, landscapes and clean air (Queanbeyan-Palerang Regional Council 2018). In the Community Strategic Plan 2018–28, the Queanbeyan-Palerang Regional Council prioritise road safety and the maintenance of road infrastructure, the protection of the natural environment and adoption of sustainable, renewable energy and management of waste.

The project is located on the boundary of four Aboriginal groups (based on Tindale 1974) comprising the Gandangara, Ngunawal, Wodi and Wandandian (Appendix Z).

8.14.3 Potential impacts

i Overview

The project may impact landowners, residents and businesses within the vicinity of the project site, with the most direct impacts likely to occur within the local study area. Some direct and indirect impacts may be further reaching and impact the regional study area.

This section provides a summary of the key potential social impacts and benefits identified as part of the SIA. The full assessment of impacts and benefits are provided in Chapter 5 of the SIA (Appendix CC).

ii Key social impacts, benefits and opportunities

Engagement activities undertaken for the SIA identified a number of social impacts (risks and concerns) and benefits potentially resulting from project-related activities. It is clear that the community consider a range of social and environmental matters important to them; and they are interested in how the project would influence the perceptions of the local area which would have a flow on effect on the livelihood of the locality.

In general, the key matters identified through the SIA specific engagement activities include:

- project-related emissions and odour impacting on air quality and local amenity;
- truck movements and road safety on the Tarago-Bungendore Road;
- increased noise associated with additional truck movements;
- decreased property value related to odour within the local area;
- negative perceptions of the community related to ‘landfills’; and
- the presence of a non-local workforce.

Odour was one the most commonly raised issues. It is noted that a number of these impacts, including odour and operational traffic, are generated by current operations at the Eco Precinct and are not expected to worsen because of the introduction of the ARC project. However, they have been considered in the SIA, as have mitigation measures.

Table 8.50 provides a summary of the key issues and an assessment of the residual impacts after mitigation.

Table 8.50 Social management and mitigation measures

Impact/challenge	Mitigated impact
Accessibility related to capacity and availability of short-stay accommodation	**Medium (negative)**
If the local rental market is inundated due to demand from the project-related construction workforce, there is potential that rental housing scarcity will increase, and rental affordability will decrease. Unmitigated, this would introduce significant issues for housing stability in the local and regional areas, especially for residents who may not be able to afford increased rent payments. This is a particular concern for vulnerable populations who would be unable to find alternative housing. To address concerns about a construction workforce that is unable to be hired locally and will need to be accommodated, Veolia will work with construction contractors to prepare an accommodation strategy. If there is a lack of capacity, Veolia and construction contractors will consider a layered approach to accommodating the construction workforce, including a combination of rental housing, short-stay accommodation in the Goulburn region, and additional accommodation (if necessary) in nearby regional centres or cities, such as Bungendore or Canberra, where there would be additional accommodation options.	
Decision making systems impacts related to approvals process for State significant development	**High (negative)**
A common perception raised during SIA field study activities was that the project will be approved despite concerns raised by the local community. SIA field studies found that there is some lack of trust within the local community due to negative perceptions of decision-making systems, given stakeholders' previous experiences with planning and approvals processes with other surrounding SSD projects. Potential impacts and mitigation measures concerning decision making systems relating to a mistrust of the approvals process for SSD fall under the responsibility of the State government rather than under the project itself. In order to contribute to the mitigation of this issue, Veolia will continue to communicate to the community the regulatory assessment and decision-making process as part of its ongoing community engagement strategy.	
Health and wellbeing related to odour	**Medium (negative)**
The SIA found existing odour was a significant key concern, with nearby neighbours reporting odour impacts from current operations at the Woodlawn Eco Precinct. Participants in the SIA are concerned the project would exacerbate the existing odour issue. Some participants reported disrupted sleeping patterns and soreness in the throat which they perceived to be a result of odour. Whilst stakeholders acknowledged Veolia's odour grievance mechanisms are in place, nearby neighbours felt that it is stressful and frustrating to engage with the odour management line and commit to odour diaries. It is noted that this issue relates to the existing operations at the Eco Precinct, and the project is not expected to exacerbate odours. However, in recognition of this issue Veolia has implemented an odour management action plan with improved grievance mechanisms, and will enhance consultation, data collection and monitoring outside of the project site within the local community, with outcomes clearly and regularly communicated to the community.	
Public safety related to primary haulage route on local roads	**Low (negative)**
Project-related traffic and poor conditions of the roads were consistently raised as a concern and identified as a vulnerability within the local area during the SIA field study. Specific concerns were raised about public safety and that project-related truck movements may further deteriorate road conditions. Traffic that would increase public safety risk as a consequence of the project will be limited to the construction period. The following mitigations will be implemented: • A detailed Construction Traffic Management Plan will be developed by the construction contractor in consultation with Goulburn Mulwaree Council prior to the commencement of construction works and will be made publicly available (Appendix T). • Veolia will continue participating in its contributions agreements with the local councils as well as liaise with and advocate to the local Councils for road maintenance and improvements. • Additionally, a transport code of conduct will be implemented for the project to ensure potential public safety impacts related to the project's primary haulage routes are mitigated.	

Table 8.50 Social management and mitigation measures

Impact/challenge	Mitigated impact
Health and wellbeing related to stack emissions	**Low (negative)**
The project will incorporate a specifically designed and engineered air pollution control system which will be integrated into the plant's process control system that will manage the operation with a key objective to minimise pollutants. It will initiate shut down procedures when pollutants are in exceedance or irregularities occur. The SIA found that some community members were concerned about project related emissions and how they will impact local air quality. Project operations must meet strict environmental standards set by the NSW EPA. The NSW *Energy from Waste Policy Statement* (2021) (EfW Policy Statement) outlines the following technical criteria: • any energy recovery facility in NSW must meet current international best practice techniques to ensure emissions are below levels that pose a risk to communities; • the EfW Policy Statement policy requires the project be fitted with a continuous emissions measurement system (CEMS); and • data on emissions is made available publicly in near real time. Veolia will communicate with local community members about project-related emissions to promote transparency and ensure residents are kept informed about stack emissions and air quality. Veolia will comply with the requirements of the EfW Policy Statement to make emissions monitoring data available to the EPA in a real time graphical publication. Veolia will make validated emission monitoring data available publicly within 24 hours following the end of a weekday and the following weekday after weekends and public holidays.	
Benefit	**Enhanced benefit**
Community related to community connectedness, resilience and community investment	**Very high (positive)**
Currently, Veolia invests and works collaboratively with the community through the Community Liaison Committee and Veolia Mulwaree Trust. To date Veolia has supported the community with over $12 million in grants, which has been distributed to 1,400 projects to enhance local facilities, education, and the environment (Veolia 2021a). To enhance the benefits of community connectedness and resilience associated with Veolia's community contributions, it is recommended that investment and community development be prioritised in the local area and tailored to the social needs of the community. Veolia will seek to refresh the structure, organisation and objectives of the CLC with the goal of meeting these plans.	
Livelihood related to training, apprenticeship, and employment opportunities	**Medium (positive)**
The construction phase of the project will require a workforce of up to 300 personnel. Where possible and practical, Veolia will encourage contractors to hire locally and will invest in apprenticeships at the site. To ensure training and apprenticeships are suitable for the local and regional area, it is recommended that apprenticeships and training programs are tailored to the local community and promote skilled employment pathways for the project. There is also opportunity to sponsor tickets and licenses required for employment in the construction industry, which would enable youth, particularly in the regional area, to gain meaningful employment as well as increase their ongoing employability. Veolia, and its construction contractors will establish apprenticeships and training programs that are tailored to the local and regional community and promote skilled employment pathways for the project.	
Livelihood related to local procurement	**Very high (positive)**
The project construction phase has the potential to create opportunities for businesses and services within the local and regional area, primarily in Goulburn, to secure new contracts and increase sales to supply and service the needs of the project (AEC 2019). Local procurement could also enable flow-on economic impacts, which would be realised in the regional area, specifically Goulburn where the majority of the workforce is anticipated to be located. To maximise local procurement benefits derived from the project it is recommended that Veolia engages with local services and the Goulburn Chamber of Commerce to establish relationships between the project and businesses within the community. Wherever possible, practical and cost competitive, Veolia and the contractors will prioritise the use of local suppliers of goods and services. Further it is recommended that Veolia encourages the project workforce, particularly during the construction phase, to support and contribute to the local and regional community through local spending.	

The project is expected to bring several positive impacts (benefits) to the local and regional communities. The SIA shows that people are interested in continuing employment opportunities during construction and operation of the project and increased skilled career pathways. In particular, during the service provider workshops, employment and education service providers identified potential opportunities and benefits related to local employment, apprenticeships and training opportunities, and scholarship opportunities. This was recognised as a positive impact as residents in the local area would be exposed to training and job opportunities leading to higher skilled career pathways, which was identified by service providers as lacking in the local area (particularly within the field of technologies).

Current community development initiatives and community contributions made by Veolia were recognised as a benefit by most stakeholders, with the project potentially increasing Veolia's community investment. It was also recognised that the project may potentially contribute to the local Council's waste goals and targets.

Other opportunities identified include local procurement during construction, which would support local businesses, potential partnerships with local community services and organisations, as well as additional road maintenance and upgrades.

iii Cumulative impact

There are several concurrent SSD projects operating or intended to operate in and around the study area. These projects may contribute cumulative impacts in addition to those anticipated consequences of the project.

A summary of SSD projects which may contribute to cumulative impacts, as identified through the NSW DPE Major Projects website is provided in Table 5.17 of the SIA (Appendix CC). A total of seven SSD projects which are within 50 km of the project and not yet operational were identified within the study area, consisting of five in the Goulburn Mulwaree LGA and two in Queanbeyan-Palerang Regional LGA. Of those projects, one is on exhibition, one has received determination, two are currently preparing EIS, and two are responding to submissions.

The three main development types identified are extractive industries and electricity generation (solar). Three extractive industries SSDs and two electricity generation SSDs were identified highlighting the strong mining and quarry presence in the study area, as well as the expanding electricity generation industry. Other development types within the study area include minerals mining, educational establishments, and livestock.

It is anticipated that these projects will likely require a similar construction and operational workforce to the project, which is also defined as an electricity generation development. This may cause potential impacts on the availability of skilled workforce in the local area, requiring additional project workforce to be sourced from outside the local and regional areas. This may increase the need for drive-in-drive-out workers, which could exacerbate pressure on accommodation and housing. However, there is potential for an increase in local job availability supported by a number of SSDs to drive industry growth in the local area and the region. Other cumulative impacts are associated with traffic and pressures on local services.

However, potential cumulative benefits may also be associated with the high number of SSD projects in the local area, such as increased employment and economic opportunities for local businesses and suppliers. The operation phase of the project will result in approximately 40 full-time jobs. The known operational workforce associated with SSD projects in the study area (including the project) is expected to be approximately 650 employees. The demand for skilled operational workforce in key sectors may increase the likelihood of cumulative socio-economic impacts, but also has the potential to create economic benefits, as well as general growth and relocation in the local area which can support the local and regional community.

In summary, potential impacts of concurrent development may include:

- impacts on local construction and general labour workforce availability;
- resultant exacerbated pressures on accommodation and housing with increase in drive-in-drive-out workers;
- increased demand on rental housing within the local and regional areas; and
- cumulative impacts associated with local amenity, noise and traffic impacts.

However, potential cumulative benefits may also be associated with the high number of SSD projects in the local area, such as:

- an increase in local job availability supported by a number of SSDs to drive industry growth in the local area and the region;
- long-term employment and economic opportunities for local businesses and suppliers;
- improvements to local infrastructure;
- general growth and community development; and
- the population and community growth associated with the proposed SSDs workforces may increase demand for more schools, childcare facilities, hospitals, specialists, and recreational activities, as well as more general social, health, emergency, and community services.

8.14.4 Management measures

i Mitigation measures

The mitigation measures summarised in Table 8.51 are intended to avoid or minimise negative social impacts and enhance positive impacts resulting from the project. This is demonstrated by the change in the social impact rating.

Mitigation measures will be implemented under a monitoring and management framework, which will be developed to ensure that the identified positive and negative social impacts are monitored over time to measure the effectiveness or otherwise of the proposed management measures, including the changing conditions and trends in the Goulburn Mulwaree and Queanbeyan-Palerang regions over the same period.

To ensure the effectiveness of the management, it is recommended that a continuous improvement approach be adopted allowing for the review and adaptation of impacts, management measures and outcomes.

Further detail about mitigation, monitoring and management measures is provided in Chapter 6 of the SIA (Appendix CC).

Table 8.51 Social management and mitigation measures

Impact/risk/aspect	ID	Assessment of social impact without mitigation	Mitigation measure	Timing	Residual social impact and nature of impact
Way of life – capacity and availability of short-stay accommodation	SOC1	Medium	Veolia will work with construction contractors to prepare an accommodation strategy for the construction workforce which will set out the approach to accommodating the construction workforce. It will consider a combination of rental housing, short-stay accommodation in the Goulburn region, and additional accommodation (if necessary) in nearby regional centres or cities, such as Bungendore or Canberra.	Pre-construction	Medium
Community – community connectedness, resilience and community investment	SOC2	Medium	It is recommended that investment and community development be prioritised in the local area and tailored to the social needs of the community. Through the CLC, there is potential to disseminate information on the project including benefits and shared value initiatives to address community needs and further promote business opportunities. Veolia will seek to refresh the structure, organisation and objectives of the CLC with the goal of meeting these plans. Veolia has invested heavily in the Mulwaree Trust to assist community focused projects. This tool for interconnectedness and social resilience will continue during and after the construction of the ARC. Education of the project will continue post approval to ensure the Woodlawn ARC and the Woodlawn Eco Precinct form a showpiece of sustainable development in the region. This will include site tours and education events to increase community understanding.	Pre-construction	Very high (positive)
Community – community character	SOC3	Low	Veolia will implement a project specific communications program which will, amongst other things, communicate the project benefits in terms of sustainable energy production and sustainable waste management.	Pre-construction	Low

Table 8.51 Social management and mitigation measures

Impact/risk/aspect	ID	Assessment of social impact without mitigation	Mitigation measure	Timing	Residual social impact and nature of impact
Community – lack of trust and negative perceptions of Veolia	SOC4	High	It is recommended that Veolia further invests in addressing current concerns raised by nearby neighbours, specifically odour, to demonstrate that these concerns are being actively addressed. This could involve communication of what Veolia is currently doing to address odour, including provision of regular air quality monitoring, reporting of odour management, and communicating outcomes to the community and the NSW Government. Veolia will, as part of its project specific communications plan (referred to above), include a series of ongoing consultation procedures covering both the construction and operational phases of the project. These will include interactive engagement processes and will be integrated with Veolia's existing community and stakeholder engagement strategy.	Construction and operation	Low
Decision-making systems – approvals process for State significant development	SOC5	High	It is the responsibility of the State government to address the community's lack of confidence in State decision making systems. Veolia will continue to communicate to the community the regulatory assessment and decision making process as part of its ongoing community engagement strategy.	Construction and operation	High
Health and wellbeing – odour	SOC6	High	Veolia will implement odour mitigation measures as proposed in the AQIA (Appendix O), and as set out by Veolia in communications with the community. Veolia will continue their odour management action plan and grievance mechanisms, with consideration given to increasing consultation, data collection and monitoring outside of the project site within the local community, with outcomes clearly and regularly communicated to the community.	Construction and operation	Low

Table 8.51 Social management and mitigation measures

Impact/risk/aspect	ID	Assessment of social impact without mitigation	Mitigation measure	Timing	Residual social impact and nature of impact
Health and wellbeing – stack emissions and air quality	SOC7	Low	Veolia will communicate with local community members about project-related emissions to promote transparency and ensure residents are kept informed about stack emissions and air quality. Veolia will comply with the requirements of the EfW Policy Statement to make emissions monitoring data available to the EPA in a real time graphical publication. Veolia will make validated emission monitoring data available publicly within 24 hours following the end of a weekday and the following weekday after weekends and public holidays.	Construction and operation	Low
Health and wellbeing – public safety related to primary haulage route on local roads	SOC8	Low	A detailed Construction Traffic Management Plan will be developed by the construction contractor in consultation with Goulburn Mulwaree Council prior to the commencement of construction works and will be made publicly available (Appendix T). Veolia will continue participating in its contributions agreements with the local councils as well as liaise with and advocate to the local Councils for road maintenance and improvements. Additionally the transport code of conduct in place should be reviewed and applied to the project to ensure public safety impacts related to the project's primary haulage routes are mitigated.	Construction	Low
Livelihood – training, apprenticeship, and employment opportunities	SOC9	Low (positive)	Veolia, and its construction contractors will establish apprenticeships and training programs that are tailored to the local and regional community and promote skilled employment pathways for the project. Benefits associated with livelihood related to training, apprenticeship and employment opportunities can be further enhanced through the implementation of vocational education and training (VET) programs delivered in regional schools.	Construction and operation	Medium (positive)
Livelihood – local procurement	SOC10	High (positive)	Wherever possible, practical and cost competitive, Veolia and the contractors will prioritise the use of local suppliers of goods and services. Further it is recommended that Veolia encourages the project workforce, particularly during the construction phase, to support and contribute to the local and regional community through local spending.	Construction	Very high (positive)

Table 8.51 Social management and mitigation measures

Impact/risk/aspect	ID	Assessment of social impact without mitigation	Mitigation measure	Timing	Residual social impact and nature of impact
Livelihood – employment opportunities	SOC11	Low (positive)	Veolia will maintain their local hiring practice, as adopted for the Eco Precinct, for this project and continue their partnerships with local and regional employment and education providers. Veolia will explore opportunities to transition trainees/apprentices to permanent work where possible. There is an opportunity to leverage partnerships with educational institutions to encourage student placements, internships, and work experience opportunities which could lead to permanent employment.	Construction	Low (positive)
Way of life – fears concerning energy recovery facility technology	SOC12	High	Veolia will continue to actively engage with the community to communicate about its technology, processes, progress on the project, and monitoring results at the project and at other energy recovery facilities.	Construction and operation	Low

8.15 Economic

8.15.1 Introduction

The economic assessment (EA) has been prepared by Gillespie Economics and is provided in Appendix DD. The EIA has been prepared in accordance with the requirements of the SEARs.

The relevant requirements of the SEARs and how they are addressed, are summarised in Appendix A and Section 3 of the EIS (Appendix DD). A summary of the existing environment, impact assessment, and mitigation measures is provided below.

8.15.2 Existing environment

The project is located in the Goulburn Mulwaree LGA. This LGA has potential to contribute to the project and derive economic benefits from construction and operation of the project.

i Population

Contrary to typical trends, the population of the region has grown relatively strongly at a similar rate to NSW. Between 2006 and 2016, the LGA population grew from 26,086 to 29,609 (13.5%), similar to the NSW population growth rate (14.2%) (ABS 2016).

In 2016, the LGA had a labour force of 13,578, and 851 people were unemployed (ABS 2016). The primary occupations of residents were community and personal service workers followed by technicians and trades workers, and professionals. The survey indicated that 58% of employed usual residents of the region work within the region. Other significant locations for employment included ACT, Wingecarribee, Queanbeyan-Palerang and, Upper Lachlan Shire (ABS 2016). The main industry sectors in which residents were employed in 2016 include hospitals (except psychiatric hospitals) (4.2%), aged care residential services (2.9%), supermarket and grocery stores (2.8%), other social assistance services (2.6%), and takeaway food services (2.6%) (ABS 2016).

ii Economic activity

The retail trade was recorded as the greatest employment sector in the regional economy, followed by health care services, residential care and social assistance services, and food and beverage services (refer Figure 2.1 in Appendix DD). This trend is similar when accounting for those residents who work outside of the region.

The gross regional product of the regional economy was estimated at $1,372 million for 2019/2020 (.id 2021). The most significant sectors of the regional economy in terms of value added are public administration and safety, (13.8%), construction (12.4%), health care and social assistance (11.6%), education and training (7.4%), and manufacturing (6.9%) – equal to approximately 52% of the regional economy and 49% of regional employment (.id 2021).

The region has experienced an employment growth of 3.6% between 2011 and 2016 (prolife.id.com.au/Goulburn) compared to 4.8% for NSW (ABS 2016). The main sectors driving growth in employment were health care and social assistance (mainly hospitals and other social assistance services), construction, and mining (mainly construction material mining).

8.15.3 Potential impacts

The project would provide economic activity to the regional economy during both the construction and operation phase. These regional economic impacts are assessed using input-output (IO) analysis, which identifies the economic activity of a project on the economy in terms of four main indicators:

- gross regional output – the gross value of business turnover;
- value-added – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output. These costs exclude income costs;
- income – the wages paid to employees including imputed wages for self-employed and business owners; and
- employment – the number of people employed (including self-employed, full-time and part-time).

i Construction

The project is considered to provide direct economic activity during construction over four sectors of the economy. These sectors are:

- the heavy and civil engineering construction sector, which includes businesses involved in onsite assembly of heavy electrical machinery from prefabricated components;
- the non-residential building construction sector, which includes businesses involved in the construction of industrial buildings;
- the construction services sector, which includes businesses involved in site preparation services, plumbing, electrical and other trades; and
- the specialised and other machinery and equipment manufacturing sector which includes the manufacturing of industrial machinery and equipment.

Given the largely specialist nature of capital equipment and the relatively small size of the regional economy, it is assumed that such purchases will be made outside of the regional economy. Accordingly, regional economic activity from the project construction phase primarily relates to the three abovementioned construction sectors.

The average annual construction workforce required for the project during construction is estimated by Veolia at 200 in 2023, 300 in 2024, 150 in 2025, 50 in 2026 and 10 in 2027. In the peak year of construction (2024) the project will approximately contribute:

- $227 million in annual direct and indirect regional output or business turnover;
- $98 million in annual direct and indirect regional value-added;
- $45 million in annual direct and indirect household income; and
- 603 direct and indirect jobs.

Flow-on employment impacts (production induced and consumption induced) are predicted to affect a number of different sectors of the regional economy. Production induced flow-ons are predicted to impact on sectors such as professional, scientific and technical services, non-residential property operators and real estate services, wholesale trade road transport, and retail trade. Consumption induced flow-ons are predicted to impact on sectors such as retail trade, food and beverage services, health care services, and wholesale trade.

ii Operation

Operational impacts of the project were assessed against a 'do-nothing' scenario where 380,000 tpa of waste would continue to be landfilled. The difference between the two impact assessments represents the incremental impact of the project to the regional economy. The project is estimated to make up the following incremental annual contribution to the regional economy:

- $37 million in annual direct and indirect regional output or business turnover;
- $39 million in annual direct and indirect regional value added;
- $7 million in annual direct and indirect household income; and
- 120 direct and indirect jobs.

Type 11A ratio multipliers, which summarise the total impact on all industries in an economy in relation to the initial own sector effect, are higher for the treatment of waste in the ARC than those associated with the diversion of the equivalent amount of waste via landfill. This is particularly the case for production induced flow-on components of the ratio multiplier, which is predicted to arise due to a reduction in landfill levy costs that accrue outside the region, but an increase in actual processing and treatment costs that occur within the region.

Flow-on impacts (production induced and consumption induced) are predicted to affect a number of different sectors of the regional economy. Production induced flow-ons are predicted to impact on sectors such as professional, scientific and technical services, other repairs and maintenance, basic chemical manufacturing, wholesale trade, and retail trade. Consumption induced flow-ons are predicted to impact on sectors such as retail trade, food and beverage services, health care services, and wholesale trade.

8.15.4 Management measures

The results of the EA indicate that the construction and operation of the project will result in net positive impacts on the level of economic activity in the regional economy. Veolia proposes to continue to work in partnership with the Council and the local community to help maximise the projected economic regional benefits whist minimising any impacts.

The management and mitigation measures are summarised in Table 8.52.

Table 8.52 Economic management and mitigation measures

Impact/risk	ID	Measure	Timing
Employment	ECON1	Employment of regional residents preferentially where they have the required skills and experience and are able to demonstrate a cultural fit with the organisation.	Construction and operation
Flow-on impacts	ECON2	Participating, as appropriate, in business group meetings, events or programs in the regional community.	Construction and operation
Non-labour inputs	ECON3	Locally source non-labour inputs to production where local producers can be cost and quality competitive, to support local industries.	Construction and operation

8.16 Hazards

8.16.1 Introduction

A preliminary hazard analysis (PHA) has been prepared by Sherpa Consulting and is provided in Appendix EE. It summarises potential hazards and risks associated with the project and details management measures which, when implemented, will reduce these hazards and risks to acceptable levels. The scope of the PHA has considered the proposed materials (feedstock fuel, in-situ additives including storage, processing and final product handling) and utilities (diesel storage and power transformers) involved in the operation of the project. The PHA provides an evaluation as to whether the project is within the meaning of "potentially hazardous" under the SEPP 33 and an assessment of risk acceptability from a land use safety and planning perspective. The PHA and project design has also been supported by a Fire Safety Study (Appendix FF).

i Assessment guidelines and requirements

The relevant requirements of the SEARs and how they are addressed, are summarised in Appendix A and Section 2.2 of the PHA (Appendix EE). A summary of the existing environment, impact assessment, and mitigation measures is provided below.

In accordance with the SEARs, the PHA has been prepared in accordance with a suite of guidelines:

- Hazardous and Offensive Development Application Guidelines – Applying SEPP 33 (DoP 2011a) (Applying SEPP 33 Guideline);
- *Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis* (DoP 2011b) (HIPAP 6);
- *Assessment Guideline – Multi-level Risk Assessment* (DoP 2011c) (Multi-level Risk Assessment Guideline); and
- *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning* (DoP 2011d) (HIPAP 4).

ii Summary of assessment methods

The analysis found that the project meets the definition of a potentially hazardous industry, and accordingly requires a PHA. It also found that the project, in the absence of controls, has the potential to cause pollutants to be discharged to the surrounding environment.

The PHA involved the following steps:

1. A SEPP 33 screening assessment in accordance with the Applying SEPP 33 Guideline.
2. Hazard identification through a review of the Applying SEPP 33 Guideline, a risk workshop, and review of past incidents occurring at energy recover facilities from residual waste.
3. Consequence analysis for those hazards with potential for offsite safety impacts.
4. Risk analysis against HIPAP 4 criteria for risks to offsite land uses and risks to the biophysical environment.

8.16.2 Existing environment

The project will occupy an area within Veolia's existing areas of integrated waste management operations within the Eco Precinct. The project will neighbour existing facilities including the existing site offices, BioEnergy Power Station and the aquaculture and horticulture operations. Other residential and industrial land uses are located at a considerable distance. The closest sensitive receptor is located approximately 4 km to the south-west.

The Eco Precinct is located at the headwaters of Lake George and Wollondilly River catchment via Allianoyonyiga Creek to the west, and the Mulwaree River catchment via Crisps Creek to the east. The Crisps Creek catchment is part of the WaterNSW regulatory area. Other prominent water features include Lake George approximately 7.5 km to the west and Lake Bathurst approximately 9 km to the north-east of the project.

8.16.3 Potential impacts

i Safety risk to offsite land uses

a Hazardous chemicals and materials

The project will require the use of hazardous chemicals and materials, particularly in the FGT system where reagents will be applied to remove contaminants from flue gas. The hazardous chemicals and quantities proposed to be stored onsite are summarised in Table 8.53.

Table 8.53 Hazardous chemicals onsite

Substance	Class	Location stored onsite	Quantity stored
Activated carbon	Dangerous Goods Class 4.2 (III)	Flue gas treatment area	24 t
Ammonia solution (25 wt%)	Dangerous Goods Class 8 (III)	Flue gas treatment area	50 m^3
APCr	Not classified as a Dangerous Good	APCr stabilisation and storage area	230 t
Diesel	C1 combustible	Above ground tank, away from main building	170 t
Hydrated lime	Not classified as a Dangerous Good	APCr stabilisation and storage area	90 t
IBA[2]	Not classified as a Dangerous Good	IBA area	19,000 t

1. APCr is stabilised with a solid binding agent (eg cement) and transported to the proposed encapsulation cell.
2. IBA is transported on the IBA hall conveyor to an undercover outdoor IBA maturation area structure.

Of the chemicals that will be stored at the ARC, activated carbon was identified as being above the SEPP 33 screening threshold (1 t) as set out in the Applying SEPP Guideline. Accordingly, the project is classified as 'potentially hazardous'. The guidelines also set threshold screening limits for the transport of hazardous materials. Transport of activated carbon and ammonia solution will be below threshold limits for both total vehicle movements and quantity per load. Accordingly, there is unlikely to be a significant offsite risk.

As activated carbon is proposed to be stored above the SEPP 33 threshold, the handling of activated carbon is further considered in the consequence analysis.

b Operational hazards

Operational hazards associated with the project were identified through a SEPP 33 review, a hazard identification workshop, and a literature review of past incidents (1997–2021) occurring at ERFs. Scenarios with potential for offsite impacts were further considered in a consequence analysis. These scenarios include:

- fire at the tipping hall and storage areas involving flammable and/or toxic material in feedstock (MSW/C&I waste);
- fire/dust explosion within the activated carbon silo arising from filling storage silos causing a combustible cloud to form within the silo;
- fire at the steam turbine hall arising from lube oil leak; and
- fire at the diesel storage area.

A summary of the consequence analysis for each scenario is provided in this section. The analysis considered heat radiation exposure levels for injury (4.7 kW/m^2) and potential fatality (12.6 kW/m^2), and overpressure levels for property damage (3 kPA), injury (7 kPA), and 100% fatality (70 kPA). The conclusion is that none of these potential incidents (fire and explosion) is likely to have offsite safety impacts.

Fire involving waste fuel

The presence of non-conforming items in received feedstock is considered unlikely as it will be received from Veolia's transfer terminals where waste will be inspected for non-conforming items prior to compaction and containerisation for transport to the ARC. However, there is still the possibility for an ignition source to come into contact with a flammable liquid spill or gas release (eg from an aerosol) within the tipping hall/bunker resulting in a fire.

Exposures for injury (4.7 KW/m^2) from this potential incident will have an effect distance of approximately 6 m, and will not reach the nearest site boundary or resident. Accordingly, a fire at the waste storage area will not have an impact offsite.

Activated carbon storage fire and explosion

Powdered activated carbon has the potential to spontaneously combust in oxygen causing a smouldering fire. The material will be stored in one silo with a capacity of 80 m^3 which may provide necessary confinement of the dust. Dispersion of the dust may, however, occur during delivery of activated carbon into the silo.

Exposures for injury (7 kPA) from overpressure for this potential incident will have an effect distance of approximately 42 m and will not reach the nearest site boundary or resident. Exposures for injury (4.7 kW/m^2) from fire radiation will have an effect distance of approximately 13 m, and will similarly not reach the nearest site boundary or resident. Accordingly, an incident involving the full inventory of activated carbon will not have offsite safety impacts.

From an onsite safety perspective, the estimated explosion overpressure level of 21 kPa (fatality potential) could impact the adjacent electrical workshop and possibly the switch room and boiler. Recommendations have been made in relation to this risk.

Fire (lube oil) at the turbine

An imbalance in the steam turbine could cause the bearings to overheat causing vaporisation of the lubricating oils. The oils may ultimately ignite, or the turbine may blow itself apart if a gas accumulation occurs within the bearing housing prior to ignition. Subsequently, a turbine fire is a real possibility which may be difficult to combat as the fire may be shielded within the bearing housing. While the building containing the turbines are sprinkler protected, this will only be beneficial in cooling down the exterior of the turbine minimising the potential for propagation. Additionally, the lubricating lines associated with the turbine may rupture resulting in oil flow which may ignite causing a liquid flow fire. This could impact adjacent fluid lines or the turbine itself resulting in damage or spreading fire.

Exposures for injury (4.7 kW/m^2) from this potential incident will be contained within the hall and will not reach the nearest site boundary or resident. Accordingly, a fire at the turbine will not have fire radiation impacts offsite.

Fire at the diesel storage

Diesel will be stored on site for start-up and shut-down in two above ground double-skinned tanks, each with 100,000 L capacity. A diesel release may occur in the event of vehicle collision with the tanks, or during tank refilling. There is only a potential for a pool fire to occur if the spill has prolonged exposure to ignition sources.

Exposures for injury (4.7 kW/m^2) from this potential incident will have an effect distance of approximately 19 m and will not reach the nearest site boundary or resident. Accordingly, a fire at the diesel storage area will not have fire radiation impacts offsite.

External events

External events (eg bushfire, aircraft crashes) were considered to have low potential for offsite safety impact. The potential for airplane impact was considered to be a low likelihood event as the Eco Precinct is not under commercial flight paths. Burning embers from bushfires was identified as possessing an ignition risk to the storage of flammable or combustible materials, however this potential was determined to be minimal as:

- there are no proposed major flammable liquid storages;
- diesel, which is a combustible liquid, is located well within the ARC and will be provided fire protection in accordance with *AS 1940:2017 Storage and Handling of Flammable and Combustible Liquids*;
- required setbacks will be provided between bush and the project to prevent flame contact and heat radiation impact to onsite facilities;
- the project will be provided with fire protection in accordance with the Building Code of Australia, Veolia's requirements and insurance standards; and
- project safety systems will allow operations team to safely shut down and secure the facility.

Risk assessment

A Level 1 qualitative risk analysis has been undertaken in accordance with the Multi-level Risk Assessment Guideline. The analysis finds that the project is compliant with the HIPAP 4 qualitative risk criteria, in particular:

- no identified events involving Class 4.2 or other dangerous good materials with significant acute safety or environment effects beyond the boundary;
- the proposed technology is well understood with standard controls;

- fires in ERFs are typically localised;
- in terms of FGT, Veolia has chosen to use aqueous ammonia solution (Class 8) in lieu of anhydrous ammonia (Class 2.3) which is less hazardous and toxic in a loss of containment event;
- the storage and use of all dangerous goods will be compliant with relevant AS and the BCA with respect to separation distances and segregation;
- safeguards will be provided as per Australian Standards and a Hazard and Operability study will be undertaken during detailed design to ensure adequate process safeguarding has been provided; and
- the project will not overly increase the cumulative risk in the area as there are no identified events with offsite effects or escalation risk.

Ultimately, the PHA has not identified any hazardous incidents with potential for significant offsite safety impacts on surrounding land uses.

ii Risk to the biophysical environment

Risks to biophysical environment arising from the project include:

- Release of aqueous ammonia solution into waterways causing an acute toxic impact on aquatic life – this material is readily biodegradable and the likelihood of a spill reaching any offsite watercourse is low as storage will be bunded. Further, an on-site stormwater management system and spill control measures will be provided.
- Process upsets involving the boiler system or FGT resulting in air impact – this risk has been considered in the AQIA (Appendix O). It finds that there are no impacts to nearest environmental sensitive receptors.
- Wetting and subsequent release of APCr into waterways impacting aquatic life – this risk is considered low as APCr will be collected in an enclosed building and stabilised before transportation to the onsite encapsulation cell.

Accordingly, no incidents have been identified that could result in an offsite effect threatening the long-term viability of an ecosystem.

8.16.4 Management measures

The PHA has made a suite of recommendations to ensure that risks are minimised and continue to be localised.

The management and mitigation measures are summarised in Table 8.54.

Table 8.54 Hazards management and mitigation measures

Impact/risk	ID	Measure	Timing
Offsite safety incidents	HAZ1	The final layout and design for the ARC will meet the safety and separation distance requirements of *AS 5026: The storage and handling of Class 4 dangerous goods*, *AS 1940: The storage and handling of flammable and combustible liquids*, and *AS 3780: The storage and handling of corrosive substances*.	Design
Offsite safety incidents	HAZ2	For FGT, account for potential activated carbon fire and explosion incidents impact when finalising the site layout (and potential impact to the electrical workshop, switch room and boiler) and silo location.	Design
Offsite safety incidents	HAZ3	Confirm there is a sufficient number and redundancy of remote emergency isolation and shutdown stations in the boiler and flue gas treatment area.	Design
Offsite safety incidents	HAZ4	For the diesel storage area, account for potential diesel bund fires and impact when finalising the site layout and location of the diesel storage.	Design

8.16.5 Cumulative impacts

Cumulative risks were considered against the HIPAP 4 qualitative risk criteria. It finds that the project will not overly increase the cumulative risk in the area as no events with offsite effects or escalation risks were identified. Those recommendations made in Section 8.16.4 should be adopted in the detailed design phase to ensure that no events with offsite effects or escalation risks arise.

8.17 Waste management

8.17.1 Introduction

An assessment of waste management impacts has been completed with reference to a number of technical studies, including the ash management study provided in Appendix E and encapsulation cell reference design provided in Appendix F. This chapter summarises the waste management aspects of the project to address the requirements of the SEARs, outlined in Appendix A.

8.17.2 Waste generation

The ARC will generate solid, liquid and gaseous waste streams. This section describes solid and liquid waste streams. Gaseous waste streams are the emissions to air generated by the combustion processes in the ARC building. Air quality impacts related to these emissions are addressed in Section 8.1 and are not considered further in this chapter.

A list and description, including quantities, composition and classification, of solid and liquid waste material produced is presented in Table 8.57. Waste classifications are presented based on the NSW EPA *Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014). The classes of waste defined in clause 49 of Schedule 1 of the *Protection of the Environment Operations Act 1997* are: special waste; liquid waste; hazardous waste; restricted solid waste; general solid waste (putrescible); and general solid waste (non-putrescible).

Table 8.55 Waste type, description, quantity and composition

Waste type	Description	Quantity	Composition and classification
IBA	Incinerator bottom ash from the combustion of waste in the ARC building. Following combustion, approximately 20% of the original waste by weight remains as IBA. Oversized material that is screened out is collected in open topped bins. IBA is then transferred by conveyor to the IBA area for screening and maturation.	76,000 t (20% of residual waste feedstock) per year	The IBA is likely to be classified as general solid waste (non-putrescible). A detailed description of the composition and classification of the IBA is presented in the Ash Management Study (Appendix E).
APCr	APCr is generated by the flue gas treatment system in the ARC building. It includes fly ash and filter bag residues.	15,200 t (4% of residual waste feedstock) per year	The APCr is likely to be classified as hazardous waste. A detailed description of the composition and classification of the APCr is presented in the Ash Management Study (Appendix E). Based on this classification the APCr will be treated to immobilise contaminants in order to reduce the classification to restricted solid waste.
Metals (ferrous and non-ferrous) from IBA processing	Ferrous and non-ferrous metals are screened at the IBA area and collected ferrous and non-ferrous metals removed from the IBA through the screening process at the IBA area and will be stored in stockpile bays and open topped bins for recycling. The total volume of recovered metals is likely to be 2% throughput.	Approximately 7,600 t (2% of residual waste feedstock)	Likely to be classified as general solid waste (non-putrescible).
IBAA	IBAA is the output of the processed IBA, following metals removal and maturation.	Approximately 68,400 t (18% of residual waste feedstock)	The IBAA is likely to be classified as general solid waste (non-putrescible). A detailed description of the composition and classification of the IBAA is presented in the Ash Management Study (Appendix E).
Brine from the demineralisation plant	Brine will be generated by a demineralisation plant that treats the water supply for the ARC.	10,875 kL per year	The effluent is likely to be classified as liquid waste.
Waste water from the effluent treatment plant	Treated waste water will be generated by the effluent treatment plant.	4,380 L per day	The waste water is likely to be classified as liquid waste.

8.17.3 Waste treatment, storage, handling and disposal

i Incinerator bottom ash

IBA is the primary waste generated by the project resulting from the combustion of residual waste feedstock. Up to 76,000 t is estimated to be generated annually. The waste classification of the IBA (refer Appendix E) as general solid waste enables this waste to be disposed to an appropriately licensed landfill without treatment. However, processing of the IBA is proposed in order to provide options for beneficial reuse. Processing of IBA once it has left the ARC building via conveyor is described in Section 4.4.2 and summarised below.

Once IBA is conveyed from the ARC building to the IBA area, it is screened prior to stockpiling for maturation. The screening process for the IBA is described in Section 4.4.2. Metals (ferrous and non-ferrous) extracted from IBA processing will be stockpiled and transported offsite for recycling at an appropriately licenced facility.

Following screening, IBA will be stockpiled at the maturation pad. The maturation process involves the stockpiling of IBA in windrows for a period of up to three months. The maturation pad will comprise an impermeable hardstand surface with a leachate and stormwater collection system. The windrows will be no more than five metres in height.

Once maturation is complete, there are four options for management of the matured IBA, now known as IBAA (also described in Section 4.4.2 and Appendix E), including:

- Disposal to landfill. During the initial operation phase of the ARC, the IBAA will be transported by trucks to the existing Bioreactor landfill for disposal. This will not generate external trucks movements from the Eco Precinct, with IBAA transported via internal access roads to the Bioreactor.
- Alternative cover material for the Bioreactor. Following the initial operation phase and once physical and chemical characteristics of the IBAA is established, Veolia intends to seek approval for the use of the IBAA as alternative cover material at the Bioreactor landfill and/or the encapsulation cell. This will not generate external trucks movements from the Eco Precinct, with IBAA transported by truck via internal access roads only to the Bioreactor and/or encapsulation cell.
- Use as a mine rehabilitation material. There may be potential for the IBAA to be used on site for mine rehabilitation purposes, subject to appropriate research and approvals.
- Beneficial re-use. Options for beneficial reuse are discussed in Section 3.5.6 and Appendix E. Reuse of IBAA will require stockpiling of this material at the IBA maturation area whilst conducting laboratory analysis to confirm characteristics until an eventual transport offsite for reuse by third parties. Beneficial reuse is likely to generate offsite truck movements. An allowance has been made in the traffic impact assessment (Appendix T) to account for the movement of material offsite in the future.

While beneficial reuse of the IBAA in the construction industry may be an option in the future, it is proposed that Veolia will review options on a regular basis to analyse market and industry opportunities. IBAA will be subject to further testing and analysis to assess its suitability, and to ensure it is fit-for-purpose and poses minimal risk of harm to the environment in order to meet the requirements for consideration of a resource recovery exemption by the EPA.

ii APCr

APCr is generated by the flue gas treatment system in the ARC building. Up to 15,200 t is estimated to be generated annually. Based on its likely classification as hazardous waste (refer to Appendix E), APCr will be stabilised at the ARC to immobilise contaminants in order to reduce the classification to restricted solid waste. In accordance with the *Waste Classification Guideline – Part 1 Classifying Waste* (EPA 2014a), hazardous waste cannot be disposed of in NSW without treatment. Treatment typically involves immobilisation to reduce the leachability of contaminants prior to landfilling.

The project proposes stabilisation of APCr using a solid binding agent (eg cement), as described in Section 4.4.1 and Appendix E. Within the ARC building, APCr will be conveyed from the storage silos to a stabilisation plant. Within the stabilisation plant, a solid binding agent (eg cement) will be mixed with the APCr plus water and combined using a specifically designed mixer. Following treatment via immobilisation, the APCr will be classified as restricted solid waste and will be suitable for disposal in the proposed encapsulation cell. The stabilised APCr will be transported from the ARC by truck, using the internal road network to the encapsulation cell and unloaded in the active filling cell. The transport route from the ARC to the encapsulation cell is shown on Figure 4.1.

The *Waste Classification Guideline – Part 2* (EPA 2014b) outlines the procedure to obtain an immobilisation approval from the EPA to allow for treatment and management of hazardous wastes. Various types of stabilisation are available, which are described in Appendix E. The Ash Management Study indicates that the APCr material generated by the ARC would require a specific immobilisation approval for a non-naturally immobilised waste. A specific immobilisation approval is required where no general immobilisation approval has previously been issued by the EPA for the hazardous waste generated, which is the case for residual by-products generated by energy recovery facilities. Prior to issue of the specific immobilisation approval (and full-scale commencement of the treatment process), the APCr material will be temporarily stored in the proposed encapsulation cell, where any leachate generated can be contained and managed. The process for an application for a specific immobilisation approval is described in Appendix E, and would involve a preliminary waste characterisation and treatment trial involving:

- commissioning and preliminary testing – preliminary waste characterisation sampling and analysis on APCr temporarily stored in the encapsulation cell;
- treatment trial and specific immobilisation approval application – trial of proposed treatment method, post-treatment waste characterisation sampling and analysis; and
- commencement of full scale operations – on receipt of specific immobilisation approval, commence full scale treatment and emplacement of APCr within encapsulation cell.

The preliminary waste characterisation sampling and analysis of APCr will be undertaken during the commissioning phase of the ARC, in order to confirm the waste characterisation, treatment rates and effectiveness of the proposed treatment option. This process would comply with the *Waste Classification Guidelines* and the POEO (Waste) Regulation 2014 requirements.

An encapsulation cell for the disposal of APCr has been designed in accordance with the Landfill Guidelines, as described in Section 4.4.3 and Appendix F.

iii Brine from demineralisation plant

Brine (or filtrate) from the demineralisation plant will be managed within the water management system and either reused in the process, or disposed to ED1. Management of brine from the demineralisation plant is discussed in the surface water assessment in Appendix V.

iv Waste water from the effluent treatment plant

Waste water from the effluent treatment plant will be treated as described in Section 8.7 and Appendix V. Treated waste water will be disposed by sub-surface drip irrigation in the designated waste water irrigation area shown in Figure 4.1 and as described in Section 8.7.

8.17.4 Management measures

The management measures in Table 8.56 will be implemented to manage impacts related to waste generated during construction and operation of the project.

Table 8.56 Waste management measures

Impact/risk	ID	Measure	Timing
Handling of IBA	WM1	The IBA area will include a stormwater management system to collect runoff which may contain potential contaminants.	Operation
Handling of IBA	WM2	IBA will be subject to further testing and analysis during commissioning to assess its suitability and to ensure it is fit-for-purpose and poses minimal risk of harm to the environment in order to meet the requirements for consideration of a resource recovery exemption by the EPA.	Commissioning
Handling of APCr	WM3	Preliminary waste characterisation and treatment trial of APCr produced at the ARC will be undertaken during the commissioning phase, in order to confirm the waste characterisation, appropriate treatment rates and effectiveness of the proposed treatment option, as part of the process to obtain the specific immobilisation approval.	Commissioning
Encapsulation cell design	WM4	The encapsulation cell will be designed in accordance with the Landfill Guidelines to ensure that contaminants within the stabilised APCr are contained.	Detailed design
Regulatory approvals	WM5	Prior to issue of the specific immobilisation approval (and full-scale commencement of the treatment process), the APCr material will be stored temporarily in the encapsulation cell, where any leachate generated can be contained and managed. Following issue of the specific immobilisation approval the material will be removed, treated and emplaced permanently within the encapsulation cell.	Commissioning
Beneficial re-use of by-products	WM6	Options for management of the IBAA and stabilised APCr will be reviewed every five years to assess market demands and identify opportunities for re-use.	Operation
Effluent generated by ARC amenities	WM7	A wastewater management system will be designed and operated in accordance with the methods described in *Designing and Installing On-Site Wastewater Systems* (WaterNSW 2019).	Detailed design

Chapter 9

Justification of the project

9 Justification of the project

This chapter provides justification and evaluation for the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development.

9.1 Summary

The Eco Precinct has developed over a 20 year period to become an integrated waste management and resource recovery operation which has prioritised sustainable and innovative waste management practices including the Woodlawn Bioreactor and Bioenergy Power Station, the MBT facility, agriculture, aquaculture and horticultural uses, and renewable energy generation. It is critical waste management infrastructure for Sydney, accepting approximately 40% of Sydney's residual putrescible waste and being one of only two landfills serving the city. The evolution of the Eco Precinct is described in further detail in Section 2.

The development of the ARC at the Eco Precinct has the key benefit of leveraging the existing logistics network which is already established to transfer waste from Sydney to the Eco Precinct. The project will utilise waste transfer terminals operated by Veolia in Sydney, and the Crisps Creek IMF in Tarago, and it requires no change to approved volumes, routes or modes for the transportation of waste feedstock. It will preserve landfill airspace, which is a limited and valuable resource in NSW, especially serving the Greater Sydney area. As an established integrated waste management operation, the Eco Precinct provides the opportunity for on site management of IBA and APCr by-products generated by the ARC.

The development of an ERF to serve Greater Sydney is identified in relevant strategic planning policies including the EfW Policy Statement and EfW Infrastructure Plan. It can meet the Government's identified objective of having one regional ERF to serve the Sydney region by 2030 (NSW WASMS 2021). Furthermore, the Eco Precinct is within the Southern Goulburn Mulwaree Precinct, identified in the NSW Government's EfW Infrastructure Plan as one of four priority infrastructure areas to deliver EfW infrastructure in NSW.

Were this project not to proceed, the only other priority infrastructure areas identified for energy from waste infrastructure in NSW in the EfW Infrastructure Plan are the West Lithgow Precinct, Parkes Special Activation Precinct and Richmond Valley Regional Jobs Precinct. In order to serve Greater Sydney, all would require the development and use of new waste transport infrastructure, either by rail or road, and all are likely to require the introduction of waste management as a new land use to the locality.

The Eco Precinct includes a substantial buffer between the project and privately-owned land, providing an opportunity to minimise impacts to neighbours, surrounding landowners and the broader community.

Finally, Veolia is able to bring its design experience and technical knowledge from operating over 65 ERFs globally to NSW, which provides the security that comes from using an experienced global operator.

The project will have both impacts and benefits, environmentally, socially, economically or culturally at the local, regional and state level. The impacts have been investigated and are not predicted to be significant, and can be adequately managed through appropriate design, mitigation and management during construction and operation. On balance it is recommended that the project should be approved.

9.2 Design development

The project has been designed to avoid and minimise impacts where reasonable and feasible. The principles of avoidance and minimisation were implemented through an iterative approach which involved numerous technical specialists. Throughout the development of the project design, Veolia has sought to optimise the project in a manner that considers the surrounding environment, avoids or minimises impacts at sensitive locations, and maintains existing natural features where present.

A range of alternatives have been considered in the development of the project design. Chapter 3 describes the reasons why the project configuration proposed is regarded as the most appropriate and feasible option. In particular, while the Eco Precinct represents a significant landholding available to Veolia, the siting of the ARC building, IBA area and ancillary infrastructure has been optimised to use land that has been subject to historical disturbance and contamination. The project represents a suitable future industrial use for these areas, which will be rehabilitated prior to construction of the project.

The ARC building has undergone significant design development and optimisation, as described in the design report in Appendix C. A detailed process of options identification and evaluation has led to the development of the reference design presented in this EIS.

9.3 Strategic context

The ARC project is supported by State government policy, and is consistent with regional plans as described in Chapter 3. The project is proposed to be constructed on land with suitable land use zoning, it largely avoids impacts to key natural and built features, and it provides economic benefits to the regional community.

A key policy document, the NSW EfW Policy Statement, was revised in July 2021 to align with the WASMS and is an important guidance document for ERF proposals in NSW. It sets out a series of criteria to be met by EfW projects. The EfW Policy Statement requires that facilities proposing to recover energy from waste need to meet current international best practice techniques to ensure emissions are below levels that pose a risk to the community. This EIS addresses the compliance of the EfW Policy Statement, which includes the specified emission standards for ERFs, as discussed in Chapter 6. With consideration that the ARC project demonstrates the principles of BAT and good neighbour principles, it is supported by these state policies and strategies.

The NSW EfW Infrastructure Plan 2021, released in September 2021, identifies four priority infrastructure areas in NSW for development of EfW infrastructure; the Eco Precinct is within one of those areas. It is the only area of the four with an existing logistics and infrastructure network for collecting and transporting waste from the Sydney basin.

9.4 Statutory compliance

In accordance with the EP&A Act, Clause 1.3 sets out the Objects of the Act. An assessment of the consistency of the ARC project with the objects of the EP&A Act is provided below with a description of the manner in which the project is proposed to meet each object. Consistency of the project with the objects of the EP&A Act is also provided in Section 5.4 of this EIS.

a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.

The ARC project will provide opportunities to continue, and enhance, the social and economic contribution to the community from the Eco Precinct.

Currently the Eco Precinct is operating below its approved capacity. The project will utilise existing approved waste streams destined for the Eco Precinct, diverting up to 380,000 tpa from landfill to the ARC for energy recovery. This will provide the benefits of both preserving landfill capacity and generating electricity from the energy recovery process. This is in keeping with the Government's objective of diverting waste from landfill to a higher order use, in this case the recovery of energy. The project supports the concept of a circular economy.

The ARC project will provide long term social and economic benefits from increased employment during construction and operation, community investment and involvement, and training and apprenticeship opportunities.

The ARC provides further opportunity to enhance community investment measures which will be adopted through the project. This is likely to create positive impacts associated with the local community investment. Shared value schemes and community programs, assist in increasing levels of community wellbeing, cohesion and social capital, particularly for vulnerable groups. The economic assessment concludes that the ARC project is desirable and justified from an economic efficiency perspective.

b) *to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.*

This EIS describes the economic, environmental and social context of the ARC project and its potential impacts to allow informed consideration of these aspects. They are outlined in Chapter 8.

Importantly, landfills do not represent ecologically sustainable development as they leave legacies to be managed in the long term. This project represents a more sustainable form of waste management.

Furthermore, a life cycle assessment of the project (Appendix R) has indicated the benefits achieved when compared to the generation of electricity in coal fired power stations.

c) *to promote the orderly and economic use and development of land.*

The ARC project will be situated on appropriately zoned land within the established Eco Precinct. Furthermore, the project represents a beneficial reuse of disturbed land that has been subject to contamination from past land uses. In addition, this site has been identified in state government policy as being appropriate for this form of development, being identified as an EfW Priority Infrastructure Area in the EfW Infrastructure Plan.

The Eco Precinct has prioritised sustainable and innovative waste management practices for the last 20 years and developed to include a range of complementary waste management and resource operations and technologies. The development footprint is surrounded by a significant Veolia owned buffer area and is relatively distant from residential and other sensitive land uses. The land is appropriately zoned for the project.

The ARC is anticipated to process up to 380,000 tpa of residual waste feedstock which will be within the existing approval limits for waste transported to the Eco Precinct. Therefore, the project does not propose any increase in approved waste volumes transported to the Eco Precinct for processing in the ARC.

d) *to promote the delivery and maintenance of affordable housing.*

The long term delivery and maintenance of affordable housing is not relevant to the project. Housing issues *during* the construction period are discussed in Appendix CC (the SIA).

e) *to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.*

The project will impact 1.55 ha of native vegetation mapped as PCT 1191 within the development footprint, however the project will not result in significant impacts on threatened species and ecological communities listed under the BC Act and EPBC Act. Impacts to native vegetation and threatened species habitat will be offset. The project design has specifically included changes to the location of the ARC access road to minimise and avoid impacts on habitat for threatened frog species. Use of previously disturbed land has been maximised to avoid impacts to biodiversity.

f) *to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).*

The ACHA (Appendix Z) reports that there is currently no documented evidence of cultural materials identified in the development footprint. The potential for cultural materials within the development footprint is considered unlikely given the historical and modern activities that have occurred.

The historical archaeological assessment (Section 8.12 and Appendix AA) determined that the area within the Eco Precinct, where the ARC is proposed to be located, was used for pastoral activities from the 1830s until the 1970s, when mining operations commenced. Since the 1970s, the development footprint has been heavily disturbed. No archaeological or built heritage items were identified within the development footprint. The results of this assessment and the impacts of the project indicate that the risk of disturbing relics is low.

g) to promote good design and amenity of the built environment,

h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.

The project will deliver an ERF to complement existing waste management and resource recovery operations at the Eco Precinct. The proposed design draws inspiration from the surrounding natural environment, rural farmland, mining, and the waste management context in which it sits.

As described in the ARC design report (Appendix C), the development footprint layout has been designed and orientated to act as a visual anchor point to the existing ridgeline located to the south of the development footprint. Conceptually, the form and external appearance of the proposed building draws inspiration from the surrounding hillside. Elements such as the undulating topography, the layers in the earth, and the organic form of the local flora are celebrated in the built form. Material selection draws influence from Veolia's commitment to sustainable methods of processing waste and generating clean electricity, which is evident throughout the Eco Precinct. A natural palette of colours has been applied to the façade to sympathise the building with the natural environment. When viewed from Collector Road this allows the reference design to sit gently within its setting. With a strong focus on the environmental enhancement, the landscape design response seeks to begin to restore endemic plant species and recreate natural habitats for local fauna.

The detailed design and construction of the building and site will comply with all relevant standards and codes. The project has been subject of both a PHA and a fire safety study which are included at Appendix EE and Appendix FF.

i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.

The project has involved consultation and coordination with a range of State Government agencies and local government. As summarised in Chapter 7, a wide range of government agencies have been consulted regarding the project.

The ARC project is supported by policy across all levels of government, as described in Chapter 3 and Chapter 5. The project is proposed to be constructed on land which is identified as appropriate by state government, has a suitable land use zoning, largely avoids impacts to key natural and built features, and provides economic benefits to the regional community.

j) to provide increased opportunity for community participation in environmental planning and assessment.

Veolia has been a valuable contributor to the local community for almost 20 years, when the CLC was established for the initial Woodlawn Bioreactor, and the former mining operations ceased. Since its inception the CLC has played an important role in providing regular community engagement.

As described in Chapter 7, there have been a range of engagement activities to inform the community about the ARC project and to seek community (and other stakeholder) feedback. This EIS provides further detailed information regarding the project and its potential impacts. It will be placed on public exhibition by DPE and community members will be able to make formal submissions. Veolia will prepare a report responding to these submissions. Further opportunities will be offered to engage with the community during EIS exhibition and beyond, as described in Chapter 7.

Recognising its important role in the community, Veolia acts as a responsible member of that community to prevent or manage potential negative impacts arising from its operations. This will continue as it embarks on the next stage of its development, whilst at the same time it maximises the benefits and opportunities it creates for the people of the region.

Through the project, there is an opportunity to enhance the relationship between Veolia and the local community by means of additional community engagement and community development initiatives specifically targeting the local area. Initiatives could include potential partnerships with local community services and organisations via the CLC and Veolia Mulwaree Trust.

9.5 Consideration of community views

As well as Veolia's ongoing community engagement program for the Eco Precinct, specific consultation was conducted for the project as described in Chapter 7. Feedback from the community has been varied and includes both positive and negative views on a range of topics. Interest in the project came from residents in the areas surrounding the Eco Precinct including the community of Tarago. Veolia's stakeholder engagement activities have focused on providing a greater level of technical detail on the project, directly in response to stakeholder requests.

The local community has a range of views. Some stakeholders recognise the economic value of the project and the benefits that will flow to the region from jobs and growth, as well as the project's place in the waste management hierarchy. Considerable interest has been shown in understanding how the technology works and how the operation of the project will relate to the continuing operation of the Bioreactor, and in particular the fact that the project does not represent an increase in the overall tonnage of waste received at the site.

There were a number of concerns raised by community stakeholders regarding how potential environmental impacts will be managed, in particular air quality and odour. Other matters of concern raised by stakeholders include potential for decreasing property values, non-local workforce, noise, water usage, truck and traffic volumes, road safety and infrastructure deterioration. The community also expressed concerns about the odours arising from current operations. In response to this, the air quality assessment for this project included a full consideration of odour, even though it is predicted that the ARC project will not contribute to total odour identified as generated on the site.

Detail of community views and responses are included in Section 7.4 and Appendix K and were identified as part of the SIA field study and engagement conducted by Veolia from the community, further outlined in Chapter 7, Section 8.14, Appendix K and Appendix CC.

9.6 Summary of project impacts

This EIS has considered the potential impacts associated with the project, as well as the need for the project and alternative development options. This section summarises the potential impacts and provides a justification for the project on environmental, economic and social grounds.

9.6.1 Environmental impacts

This EIS has assessed potential impacts to the biophysical environment which are summarised below:

- Emissions to air and water:
  - Air quality and odour emissions have been assessed on a highly conservative basis and are not predicted to be significant. The assessment predicts no significant impacts at assessment locations, which include sensitive receptors such as residential dwellings, recreational land uses, schools, churches and other community facilities. All predicted concentrations and deposition rates for modelled pollutants are well below the applicable impact assessment criterion at all assessment locations. The project is not predicted to generate additional odour, therefore no cumulative impacts with existing operations are predicted.
  - Greenhouse gas emissions from the project will result in an overall net benefit to the environment.
  - Water-related impacts, including groundwater and surface water, are not predicted to be significant. Groundwater used by the project will be sourced from existing WAL entitlements held by Veolia, and abstraction of groundwater will not impact third-party users who extract water from the same groundwater source. Surface water will be managed within a closed system and will be integrated with the existing water management system at the Eco Precinct, with no discharges to watercourses.
- Physical impacts to soils, biodiversity, and heritage:
  - Contamination of soils has occurred due to past land uses which have resulted in elevated concentrations of metals, low pH soils and stockpiled material within the development footprint. Prior to construction of the project, rehabilitation of the development footprint will be undertaken in accordance with existing consents and management plans to ensure suitability of the development footprint for the proposed future use as the ARC.
  - Biodiversity impacts are associated with the clearing of 1.55 ha of poor quality vegetation in the development footprint, however the project will not result in significant impacts on threatened species and ecological communities listed under the BC Act and EPBC Act. Impacts to native vegetation and threatened species habitat will be offset. Under the BAM, the project requires 31 ecosystem credits to offset impacts to 1.55 ha to PCT 1191.
  - No impacts to Aboriginal or non-Aboriginal heritage are predicted.
- Amenity impacts including visual, traffic, and noise:
  - Visual impacts are not predicted to be significant. The ARC building is the primary visual feature of the project and has been designed to integrate with the surrounding environment to minimise visual impacts.
  - Traffic impacts are not predicted to be significant. Traffic generation during the peak construction period will result in a temporary reduction to the level of service on Bungendore Road and Collector Road. No material traffic impacts are expected during operation of the project.
  - Noise impacts are not predicted to be significant, with relevant assessment criteria predicted to be met at all privately-owned assessment locations (residential dwellings) during both construction and operation.

- Risks to human health and the environment from air emissions and hazards and risks associated with the project:
  - Human health impacts are not predicted to be significant. Using data from the air quality impact assessment, the HHRA examined potential pathways into the human body. Even with long-term exposure to multiple pathways, no significant health risks were identified.
  - Hazards and risks associated with the project are not predicted to be significant. Risks have been assessed through a PHA, a bushfire risk assessment and a fire safety study. Risks can be managed to acceptable levels with adherence to relevant building and design standards and incorporation of other mitigation and management measures.

9.6.2 Economic impacts

As identified in the Economic Impact Assessment, described in Section 8.15 and provided in Appendix DD, the project will provide positive impacts in the form of economic activity in the regional economy during both the construction and operation of the ARC.

The ARC project will provide long-term livelihood benefits from ongoing and increased employment, community investment and involvement, and training and apprenticeship opportunities.

Standard regional economic impact assessment using input-output analysis estimated that, in the peak year of construction, the project will make contributions to the regional economy in the form of annual regional output or business turnover, regional value-added, household income and employment.

The project operation is estimated to make up to the following incremental annual contribution to the regional economy:

- $37 million in annual direct and indirect regional output or business turnover;
- $39 million in annual direct and indirect regional value added;
- $7 million in annual direct and indirect household income; and
- 120 direct and indirect jobs.

To further maximise the projected economic regional benefits and minimise any potential impacts, Veolia proposes to continue to work in partnership with the Goulburn Mulwaree Council and the local community to incorporate a range of general economic impact mitigation and management measures, including:

- employment of regional residents preferentially where they have the required skills and experience and are able to demonstrate a cultural fit with the organisation;
- participating, as appropriate, in business group meetings, events or programs in the regional community; and
- locally sourced non-labour inputs to production where local producers can be cost and quality competitive to support local industries.

9.6.3 Social impacts

The SIA prepared for the project (Appendix CC) provides an assessment of potential social impacts and benefits associated with the ARC. It identifies the relevant social issues, potential social impacts and benefits, and associated mitigation and enhancement measures applicable to the design and operation of the project in accordance with the *SIA Guideline 2021* (DPIE 2021f).

The project will provide direct benefits to NSW overall, through the diversion of residual waste from landfill and the generation of up to 30 MW of electricity from this renewable source. The project will also directly benefit the local area and the regional area of the Goulburn Mulwaree LGA and Queanbeyan-Palerang LGA, as outlined in the SIA (Appendix CC), and summarised in Section 8.14 of this EIS. While the project has potential negative impacts as outlined below and discussed in Section 8.14, it is considered that these can be managed to acceptably low levels.

Mitigation and management strategies have been proposed for each of the identified potential social impacts to minimise negative consequences and to maximise social benefits for the local community. Performance indicators should be developed by Veolia for each mitigation and enhancement measure in consultation with stakeholders and will be monitored throughout the project life span by Veolia.

An adaptive approach will allow Veolia to manage and respond to changing circumstances and new information over time through ongoing monitoring and periodic review of mitigation strategies; this will allow for modification if required and if appropriate. This adaptive approach will ensure that the management of potential social impacts identified in the SIA will result in effectively minimising potential negative social impacts and maximising potential social benefits for the local community. The proposed mitigation and enhancement measures are summarised in full in Appendix E.

Veolia will continue to invest in and support local communities. These shared value schemes and community programs will increase levels of community wellbeing, cohesion and social capital, particularly for vulnerable groups within the community.

9.6.4 Ecologically sustainable development

The principles of ecologically sustainable development (ESD) are outlined in Schedule 2 of the EP&A Regulation. The consistency of the project with each of these principles is provided in Table 9.1. Based on the justification in Table 9.1, the project is considered to be consistent with the principles of ESD.

Table 9.1 Consideration of principles of ecologically sustainable development

Principle	Ecologically sustainable development principle	Evaluation of project impacts against principle
Precautionary principle	The **precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by— (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (ii) an assessment of the risk-weighted consequences of various options.	During the project planning phase and preparation of this EIS, experts in their respective fields have carefully considered environmental outcomes through the preparation of quantitative technical assessments, providing a high degree of certainty around the impacts that may rise from the project. These technical assessment (Appendix F–DD) findings are summarised in Chapter 8 of this EIS. Baseline environmental characteristics have been monitored to understand the condition of the existing environment at and around the site, and to understand the environment impacts of previous and existing operations. This data in combination with publicly available data from the region has been used by experts to identify and assess the potential environmental impacts of the project in accordance with current government policies and guidelines. Veolia has numerous similar operations globally and the potential environmental impacts associated with the activity are well understood and have been effectively managed resulting in negligible environmental impact. This experience and knowledge has been used to design the project and predict and manage potential environmental impacts. Hence, careful consideration has been given to other project alternatives, including: site selection, fuel source, plant technology, and ash management options. The project will be designed with regard to the applicable NSW legislation and policies, and key European Union (EU) guidance including the Industrial Emissions Directive and the Best Available Techniques (BAT) Reference Document for Waste Incineration: *Industrial Emissions Directive 2010/75/EU* (Integrated Pollution Prevention and Control) (2019) (the BREF document) to ensure that it does not pose an unacceptable risk to human health or the environment. Hence, design to represent the application of the Precautionary Principle. Management measures have been proposed for all potential environmental impacts. Taking these measures into account, it is considered that there would be no threat of serious or irreversible damage to the environment. Therefore, the project is consistent with the precautionary principle.

Table 9.1 Consideration of principles of ecologically sustainable development

Principle	Ecologically sustainable development principle	Evaluation of project impacts against principle
Social equity including inter-generational equity	**Inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.	A range of mitigation and compensatory measures are proposed that will minimise the impacts of the project during construction and operation. The project will provide a net reduction in greenhouse gas emissions. The project will facilitate the reduction in greenhouse gas intensity of energy generation in NSW and will create a significant benefit by avoiding the generation of landfill gas, which is a significant greenhouse contributor (refer Section 8.3). The total operational GHG emissions for the ARC project with the approved limit of waste to the Eco Precinct was calculated to be 323,850 t CO2-e/year. Taking into account, the substitution of electricity generated by the ARC project, the net operational GHG emissions were 74,611 t CO2-e/year. This represents an overall reduction of 50% compared with the Eco Precinct without the ARC. The net emissions for the project represent 0.01% of national GHG emissions, and 0.05% of GHG emissions in NSW. When viewed on the scale of total emissions from all sources in NSW and Australia, the emissions from the Eco Precinct are not considered significant. The GHG emissions intensity of electricity generated by the project (0.64 kg CO2-e/kWh) is lower than the GHG emissions intensity of electricity from the NSW grid (0.85 kg CO2-e/kWh). Therefore, the project has the potential to eliminate a substantial quantity of CO2-e emissions through the reduction of fugitive methane emissions and the substitution of grid electricity. The GHG assessment is supported by a Life Cycle Analysis (Appendix R which indicates the benefits provided by the project over alternative power generation (coal and natural gas). The diversion of waste from landfill maximises the efficiency of available landfill airspace, potentially extending the life of existing landfill infrastructure and deferring the need for new landfills further into the future, which is an intergenerational benefit of the project. Given these issues it is considered that the project supports inter-generational equity.
Conservation of biological diversity and maintenance of ecological integrity	**Conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.	The conservation of biological diversity and ecological integrity was a fundamental consideration in the development of the project. The BDAR was prepared to assess potential impacts of the project (Section 8.10). Direct impacts to 1.55 ha of native vegetation or habitat for threatened species will occur as a result of the project. Realignment of the ARC access road and intersection with Collector Road was able to avoid wetland areas that supported habitat for potentially threatened species, which has improved biodiversity outcomes for the project.

Table 9.1 Consideration of principles of ecologically sustainable development

Principle	Ecologically sustainable development principle	Evaluation of project impacts against principle
Improved valuation and pricing of environmental resources	**Improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as— (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.	A comparison of costs and benefits of the project demonstrates that benefits outweigh the costs. The project will provide up to 40 jobs during operation and will continue to provide economic benefits to the local community. The economic assessment undertaken for the project (Appendix DD) provides monetary estimates of the intangible environmental, cultural and social impacts of the project. While these are estimates, they provide an indication of the economic value of environmental resources associated with the project. Veolia accepts the financial costs associated with all the measures required for the project to avoid, minimise, mitigate and manage potential environmental and social impacts. A life cycle analysis (LCA) was undertaken as described in Section 8.2 and Appendix R for the ARC and the functional unit of this study is the production of 1 MWh from residual waste at Woodlawn ARC. The ARC project is expected generate approximately 240,000 megawatt hours (MWh) of electricity per annum from the thermal treatment of residual wastes with a nominal capacity of up to 380,000 tonnes per annum. Accounting for parasitic loss, the exportable electricity is expected to be 219,830 MWh per annum. The results of the LCA show that 1 MWh of residual waste-based power generation system performs better across all environmental impact categories assessed compared to an equivalent 1 MWh coal-based power generation systems. The residual waste-based power generation system results in 183% emissions reduction (GHG-total) compared to coal-based power generation system. This reduction is primarily due to avoided landfilling of residual wastes. The predicted annual GWP-total savings from the Woodlawn ARC project is 395,034 tonnes of CO2 e. per year when compared to electricity production using hard coal. Overall, the project is estimated to have net economic and social benefits with net production benefits of over $600 M initial investment in regional NSW and a further $2 B investment over the lifetime maintenance and employment. The project will also see sustainability improvement and added valuation through the generation of up to 30 MW of electricity, enough to power almost 40,000 homes per year from a low carbon energy source.

9.7 Cumulative impacts

Development, both within and in the vicinity of the Eco Precinct, has the potential to generate cumulative impacts with the project. An assessment has been completed with reference to the DPIE's *Cumulative Impact Assessment Guidelines* (DPIE 2021e). The assessment has included consideration of:

- Incremental impacts – impacts of the project to the existing baseline condition of each relevant assessment matter (eg air quality, odour, noise, water, biodiversity, heritage, traffic, employment and workforce) – this is largely completed in relevant technical assessments and summarised in this section.
- Combined incremental assessment – combined effect of the different impacts of the project, summarised in this section.
- Issue-specific cumulative assessment – impacts of the project together with the impacts of other relevant future projects on specific issues within an identified area, summarised in this section. It is noted that the closest future project is 17 km for the ARC project, so impacts are somewhat more limited to those at a regional scale, rather than specific areas.
- Combined cumulative assessment – considering the combined effect of the different cumulative impacts of the project with other relevant future projects on key matters in an identified area. This is largely qualitative and combined with the issue-specific cumulative assessment in this section. The qualitative nature relates to a range of uncertainties including:
  - the level of detail available for future projects – often future projects are at early stages of the planning process and limited information is available regarding the nature, timing and potential impacts of such projects;
  - the likelihood that those projects will proceed – while many projects will gain approval, some may not, and some projects may never proceed despite gaining approval; and
  - the uncertainty of timing of future projects – while they may proceed at some point in the future, the timing is unknown.

9.7.1 Incremental impacts

Existing operations at the Eco Precinct (including waste management and resource recovery, mining, renewable energy generation operations) have been considered in the cumulative assessments of each of the technical reports, and in particular for air quality and odour, noise, traffic, surface water and groundwater, visual. It is noted that Woodlawn Mine, within the Eco Precinct, is not operational due to being in care and maintenance mode, however the cumulative impacts have been conservatively assessed by assuming the mine is operational. The impacts from existing operations have been assumed as part of the baseline conditions, and the incremental impacts of the project have been assessed to identify the change in baseline. Cumulative impacts with other existing activities and developments, including agricultural and residential uses that generate air quality emissions (dust generation from agricultural activities, wood heater emissions), generation of noise from other sources that contribute to background noise levels, use of transport routes by local traffic and social impacts and benefits associated with other existing development in the local area. These impacts have been accounted for through the incorporation of background data into modelling.

9.7.2 Other state significant projects

There are seven active state significant projects, all SSD, recently approved or proposed in the local area identified through DPE's Major Projects Planning Portal. A radius of approximately 50 km from the ARC project has been used to identify future projects of relevance. These projects are listed in Table 9.2 in ascending distance to the project. These have been identified as 'future projects' for consideration of cumulative impacts. Of the seven SSD projects within approximately 50 km of the project five are in Goulburn Mulwaree LGA and two are in Queanbeyan-Palerang Regional LGA.

The greatest potential for cumulative impacts of future projects and the ARC project are related to:

- Construction of two solar farm developments, Marulan Solar Farm and Blind Creek Solar Farm, which have the potential to have construction periods that overlap with the ARC project construction and have substantial workforce requirements that may draw construction workers from the same region.

- Construction and operation of the Goulburn Poultry Processing Mixed Use Development, which has the potential to have a construction period that overlaps with the ARC project construction and may seek to draw workers from the same region. The greatest workforce demand for this future project is during the operation period.

It is noted that the SEARs for the project specifically request the assessment of cumulative impacts with emissions from the proposed Jerrara Power Energy from Waste Facility (SSD22879238). The Jerrara Power Energy from Waste Facility has been withdrawn by the applicant, as noted on DPE's Major Projects Planning Portal. It is understood that approval is no longer being sought at this time and therefore no cumulative impact assessment has been completed.

Table 9.2 Cumulative impacts with future projects identified within 50 km of the ARC project on the DPE Major Projects Planning Portal

Project name and development type	Approx distance to project	Status/indicative timing/overlap with project	Construction and operational workforce	Overlap with project and potential for cumulative impacts
Blind Creek Solar Farm (solar farm)	17 km south west of the project, 43 km south west of Goulburn	Response to submissions (EIS publicly exhibited June/July 2022). Construction period of 12–18 months and operational life of 30 years.	Construction – 300 Operation – 5	This future project involves construction of a solar farm. There is some potential for cumulative impacts related to construction if there is overlap of solar farm construction with the project's construction period. The potential period of overlap may be up to 12–18 months (ie the duration of the solar farm construction). The construction workforce for the solar farm is up to 300 people and has the potential to draw from a similar region as the ARC project given the proximity of both projects to Goulburn. Furthermore, access to the Blind Creek Solar Farm is via Tarago Road, therefore there is potential for cumulative impacts on Tarago Road and Bungendore Road if construction periods for the two projects overlap. No cumulative impacts are likely for operation.
New High School in Bungendore (public infrastructure)	25 km south west of the project, 60 km south west of Goulburn	Response to submissions (EIS publicly exhibited September 2021). Construction period of approximately 12 months from early 2022 to early 2023.	Construction – 110 Operation – 41	This future project involves construction of a new high school. It is unlikely that there will be overlap with construction of this future project with the ARC project if constructed within the period specified in the EIS (ie completion in early 2023). Therefore, cumulative construction impacts are unlikely. There are not likely to be cumulative impacts during operation.
Goulburn Poultry Processing Mixed Use Development (mixed use development)	37 km north east of the project, in Goulburn	Response to submissions (public exhibition completed October 2019 – no response to submissions lodged by November 2021). Timing of project unknown given elapsed time since EIS was publicly exhibited.	Construction – 88 Operation – 264	This future project is a new land use within Goulburn. It is noted that two years have passed since completion of the public exhibition of the EIS for this future project. This future project is spatially distant from the ARC. The potential cumulative impacts considered are related to regional traffic generation, and workforce. There is potential for cumulative impacts on the regional road network if there is an overlap with the construction of the ARC project. Additionally, there is potential to place pressure on workforce availability.
Marulan Solar Farm (solar farm)	50 km north east of the project, 15 km east of Goulburn	EIS in preparation. Construction to commence 2022 to be fully operational by 2023.	Construction – 200 Operation – 5	This future project involves construction of a solar farm. The future project is spatially distant from the project, 50 km north east. There is some potential for cumulative impacts related to workforce if there is overlap of solar farm construction with the construction period for the project. The potential period of overlap may be up to 12–18 months (ie the duration of the solar farm construction). The construction workforce for the solar farm construction is up to 200 people and has the potential to draw from a similar region as the ARC project given the proximity of both projects to Goulburn.

Table 9.2 Cumulative impacts with future projects identified within 50 km of the ARC project on the DPE Major Projects Planning Portal

Project name and development type	Approx distance to project	Status/indicative timing/overlap with project	Construction and operational workforce	Overlap with project and potential for cumulative impacts
Marulan South Limestone Mine Continued Operations Project (extractive industry)	51 km north east of the project, 26 km east of Goulburn	Determination – 19 August 2021. Project life of 30 years.	Construction – none Operation – 191	This future project is a continuation of an existing operation. This future project is spatially distant from the ARC. There is no construction period. The operational workforce is a continuation of the existing quarry operations. No cumulative impacts have been identified for this future project.
Marulan Quarry (extractive industry)	53 km north east of the project, 26 km east of Goulburn	EIS in preparation (SEARs issued March 2020). Initial construction activities for site establishment and project life of 18 years.	Construction – 10 Operation –10	Marulan Quarry is a proposed quarry operation at greenfield site. This future project is spatially distant from the ARC. The only potential cumulative impact considered is related to regional traffic. The Scoping Report identifies an average of 45 trucks per day transporting product from the quarry via the Hume Highway to Sydney, and other regional markets. There is not expected to be a significant overlap with traffic routes used by the project during construction or operation. The workforce requirements are minimal and are not likely to result in a cumulative impact on community services. No cumulative impacts have been considered further for this future project.
Gunlake Quarry Continuation Project (extractive industry)	55 km north east of the project, 22 km east of Goulburn	Assessment (exhibition completed October 2021). Project life of 30 years.	Construction – none Operation –70	This future project is a continuation of an existing operation. This future project is spatially distant from the ARC. There is no construction period. The operational workforce is a continuation of the existing quarry operations. No cumulative impacts have been identified for this future project.

Source: DPE Major Projects website accessed 16 November 2021.

9.7.3 Other related development

As described in Section 1.5, the project may require electrical distribution infrastructure and/or associated augmentation works to support this project (ie transmission/distribution lines). If required, these will be subject to a separate environmental assessment process under Part 5 of the EP&A Act.

This EIS has presented the option of upgrading Essential Energy's existing 66 kV transmission line from the Eco Precinct to the Goulburn Substation. Veolia is continuing to work with Essential Energy to further understand requirements for connection to the distribution network. The approximate length of this 66kV overhead transmission line is 37 km. A high-level environmental and social sensitivity analysis of this option has been undertaken and is included at Appendix N.

Depending on the outcome of connection enquires with Essential Energy, works relating to augmentation/upgrade of electrical distribution infrastructure along the 37 km of existing transmission line from the Eco Precinct to the Goulburn Substation will likely be undertaken in parallel with construction of the ARC project. There is some potential for cumulative construction impacts, although the nature of works along a transmission line corridor are such that works in any one location will be relatively short term due to the linear nature of the infrastructure. This is likely to minimise the potential for impacts during the construction period, which will likely be amenity-related, such as construction dust, noise and traffic. These will be able to be managed with standard environmental mitigation and management measures.

9.7.4 Assessment of cumulative impacts

i Employment and workforce

The employment demands for the above future projects may cause potential impacts on the availability of skilled workforce in the local area, should construction periods overlap substantially. This may require additional workers to be sourced from outside the local and regional areas.

The potential of a non-resident and relocating workforce from the concurrent developments may contribute to the cumulative impacts in the local area. This may result in impacts on the capacity and availability of local service providers, accommodation providers and traffic. However, potential cumulative benefits may also be associated with the high number of SSD projects in the local area, such as increased employment and economic opportunities for local businesses and suppliers.

Local construction and general labour workforce availability may also be impacted by these concurrent developments. This may result in a shortage of workers which would increase the need for drive-in-drive-out workers which would exacerbate pressures on accommodation and housing. However, there is potential for an increase in local job availability supported by a number of SSDs to drive industry growth in the local area and the region.

The operation of the project will result in approximately 40 full-time jobs. The demand for skilled operational workforce in key sectors including for the project and other future projects may increase the likelihood of cumulative socio-economic impacts relating to increased pressures on social infrastructure, services, and housing locally and regionally. However, a high demand for long-term operational workforce within the local area has the potential to create economic benefits, as well as general growth and relocation in the local area which can support the local and regional community.

ii Amenity

The significant separation distance between the Eco Precinct and future projects will mitigate most localised impacts. As noted previously the Eco Precinct includes a substantial buffer area which helps to manage the potential for cumulative impacts.

Potential amenity impacts could arise from dust accumulation from an increase of truck movements, especially during construction phases as well as noise caused by plant and equipment operating, and traffic generation on local roads, primarily related to the Blind Creek Solar Farm which is the closest future project.

Potential cumulative visual impacts may result from the ARC building being constructed in conjunction with other development at the Eco Precinct. The project is considered to represent orderly development of suitably zoned land for an operation that is complimentary to existing land uses. Cumulative impacts with other development outside the Eco Precinct are not likely as the ARC is surrounded by substantial buffer areas which spatially separate it from other development. The ARC building is considered to have limited potential to increase the significance of cumulative visual impact with regard to existing large scale visual elements, including the Woodlawn Wind Farm (operated by Iberdrola), located within the Eco Precinct. This is largely due to visual screening surrounding the Eco Precinct for most receiver viewpoints as well as the location of ARC building project elements relative to existing infrastructure.

iii Traffic and public safety

Several of the future projects have the potential for cumulative impacts related to increased traffic and road degradation of Tarago Road and Bungendore Road, primarily Blind Creek Solar Farm and the New High School in Bungendore. These projects are expected to require increased heavy vehicle movements during construction. In particular, the Blind Creek Solar Farm will be accessed from Tarago Road, south of the Eco Precinct. There is potential for cumulative traffic impacts along Tarago Road and Bungendore Road if the two construction periods overlap.

iv Services

Local socio-economic growth associated with local projects and development can increase the need for funding and presence of local social and health services due to increased pressures and demand from workforces of the concurrent SSDs. Population and community growth associated with the proposed SSDs workforces may increase demand for more schools, childcare facilities, hospitals, specialists, and recreational activities, as well as more general social, health, emergency, and community services.

A potential cumulative benefit of the large number of local projects is related to significant combined community contribution, economically and otherwise.

v Rental housing

In March 2021, the vacancy rate of the local area was below 3.0% (1.2%) suggesting the rental market in the local area is tight, consistent with the low number of properties available to rent and low proportion of rented dwellings (ABS 2016).

Increased demand for skilled workforce and trades skills more generally, may arise with the construction and operation of concurrent SSD projects. This may cause potential impacts on the availability of skilled workforce in the LGA, requiring additional project workforce to be sourced from outside the local and regional areas, which may increase demand on rental housing within the local and regional areas (further discussed in Section 8.14 and Appendix Z).

This has significant potential consequences for persons currently at risk of financial hardship, housing instability and homelessness, particularly in the context of the pandemic, which has further contributed to increased rents and lower rental availability in regional areas of Australia, including the Goulburn Mulwaree area, due to migrations from urban centres to more regional and rural areas (Anglicare 2021, Goulburn Post 2021). Commitments to local hiring, provision of training and apprenticeship opportunities for local workers, and partnership with local employment and training services could reduce the need for outsourcing of workers.

9.8 How compliance will be ensured

A monitoring and management framework will be developed to enable the potential positive and negative impacts to be monitored over time. Targets will be identified to measure the effectiveness of the proposed management measures, including the changing conditions and trends in the Goulburn Mulwaree and Queanbeyan-Palerang regions over the same period.

It is proposed that the monitoring and management framework identifies the following key aspects:

- track progress of mitigation and management strategies;
- assess actual project impacts against predicted impacts;
- identify how information will be captured for reporting to impacted stakeholders including landholders, communities and government on progress and achievements;
- key performance indicators, targets and outcomes;
- responsible parties; and
- mechanisms for ongoing adaption of management measures when required.

To ensure the effectiveness of the management measures for the identified positive and negative impacts, it is recommended that a continuous improvement approach be adopted allowing for the review and adaption of impacts, management measures and outcomes.

Veolia's current community and stakeholder engagement strategy includes provisions that deliver information and encourage community feedback related to (but not limited to):

- updates on the status and life of the project;
- community investment and community development opportunities; and
- issues related to the current operation of the Eco Precinct.

Veolia's community and stakeholder engagement strategy incorporates a range of communication strategies and opportunities to provide feedback through a variety of channels, including:

- CLC meetings;
- community information sessions (face to face and virtually);
- stakeholder briefings;
- project website updates;
- contact channels – dedicated project information number and email;
- newsletters; and
- Tarago times and other local news channels such as the Goulburn Post.

This approach ensures that mechanisms for both information dissemination and feedback collection are incorporated. A monitoring and management framework within Veolia's existing community and stakeholder engagement strategy will be adopted for the project.

An adaptive approach will allow Veolia to manage and respond to changing circumstances and new information over time through ongoing monitoring and periodic review of mitigation strategies; this will allow for modification if required and if appropriate. This adaptive approach will ensure that the management of potential environment and social impacts identified in this EIS will result in minimising potential negative impacts and maximising potential social benefits for the local community. The proposed mitigation and enhancement measures are detailed in Section 8.14.4.

9.9 Key uncertainties and proposed measures

Veolia operates over 65 energy recovery facilities internationally and has unmatched experience in consistently operating to meet regulatory standards, key performance indicators and continuously improve by the use of best available technologies. This section provides a summary of the identified potential environmental, social and economic impacts. Mitigation and management strategies have been proposed for identified potential impacts to minimise negative consequences and to maximise social benefits for the local community. Veolia will develop performance indicators for measuring impacts and benefits in consultation with stakeholders and these will be monitored throughout the project life by Veolia. A summary of mitigation measures is included in Appendix E.

9.10 Conclusion

The Woodlawn Eco Precinct is an important integrated waste management site for NSW, accepting some 40% of Sydney's putrescible waste. It forms a key part of a waste management system which comprises two transfer terminals in Sydney (Clyde and Banksmeadow) where waste is sorted and loaded into purpose-built containers for transport by rail to Crisps Creek IMF and then on to Woodlawn by truck.

The project has been designed to:

- comply with waste policy in NSW by preserving landfill space, directing residual waste to a higher order option (energy recovery), in compliance with the waste hierarchy and the concept of the circular economy;
- maximise the use of disturbed land to minimise impacts, including re-design of the ARC access road to avoid wetlands and areas of native vegetation;
- use EfW technology that is demonstrated as BAT; and
- complement existing land uses at the Eco Precinct which have developed since 2004 and is compliant with land use zoning and objectives for the land.

The project is also located within an Infrastructure Priority Area identified by the NSW Government EfW Infrastructure Plan released in September 2021.

The project will provide environment, social and economic sustainability benefits to NSW as the ARC will divert up to 380,000 tonnes per annum of waste from going to landfill. In this regard, the ARC project supports a circular economy by providing a higher order waste treatment method which recovers energy from waste that would otherwise be disposed at landfill. ERFs are recognised as a legitimate waste disposal process after waste avoidance, reuse and recycling, by the EU Waste Directive and NSW legislation and policy as discussed in Chapter 6.

At a regional level, the project will contribute to the regional economy through increases seen in direct and indirect business turnover, value add, household income and job creation, during the three year construction period and the overall project operation.

Overall, there will be an increase in regional economic activity as a result of the management of waste via thermal treatment, and a reduction in landfill levy costs that accrue outside the region. The ARC project is desirable and justified from an economic efficiency perspective, with net production benefits from initial investment and over the life of the project in terms of maintenance and employment.

The project will have potential social impacts and benefits. The project will see a social sustainability improvement through the generation of up to 220,000 MWh of electricity annually, enough to power almost 40,000 homes per year with renewable energy. Electricity generated by the project will have a lower global warming potential compared to electricity generated by other means including hard coal, biomass and natural gas generation (Appendix R).

Through the project, there is an opportunity for enhancements to the local community, increased community engagement with Veolia and implementation of community development initiatives, specifically targeting the local area. Potential partnerships with local community services and organisations will be available as a result of the project.

The project will result in environmental and social impacts as identified throughout the EIS, which will be managed through the mitigation and management measures described throughout, such that the project will not result in significant environmental or social impacts.

The ARC will achieve the following overall benefits:

- alignment with the Commonwealth, NSW waste policies and strategies and the regional plans;
- low carbon energy generation for the equivalent of almost 40,000 homes, contributing to electricity generation from alternative energy sources, other than the burning of fossil fuels;
- provision of a coordinated approach through planning compatible land uses associated with waste management and recovery, which represents an orderly and economic use of land; and
- additional employment within the region, with direct and indirect employment benefits, including direct employment of up to 300 staff during the construction and 40 staff during operation.

On balance, it is considered that the Veolia's ARC project will provide long-term livelihood benefits from ongoing and increased employment, community investment and involvement, and training and apprenticeship opportunities.

Abbreviations

ABS	Australian Bureau of Statistics
ACC	Air Cooled Condenser
ACHA	Aboriginal Cultural Heritage Assessment
AEMR	Annual Environmental Management Report
AGEIS	Australian Greenhouse Emissions Information System
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
APC	air pollution control
APCr	air pollution control residues
APZ	Asset Protection Zones
ARC	Woodlawn Advanced Energy Recovery Centre
ARENA	Australian Renewable Energy Agency
BAM	Biodiversity Assessment Method
BAT	best available techniques
BCA	Building Code of Australia
BDAR	Biodiversity Development Assessment Report
BFPA	Bushfire Protection Assessment
BFMC	Bushfire Risk Management Committee
bgl	Below Ground Level
Bioreactor	Woodlawn Bioreactor
BoM	Bureau of Meteorology
BP	Before Present
CAR	Contamination Assessment Report
CCR	Central Control Room
C&D	Construction and Demolition
C&I	Commercial and industrial
CEMP	Construction Environment Management Plan
CEP	Community Engagement Plan
CHETRE	Centre for Health Equity Training, Research and Evaluation
CLC	Community Liaison Committee
CNVS	Construction Noise and Vibration Strategy
CTMP	Construction Traffic Management Plan
DAWE	Department of Agriculture, Water and the Environment

DCS	Distributed Control System
DEC	Department of Environment and Conservation
DECC	Department of Environment Climate Change
DECCW	Department of Environment Climate Change and Water
DDG	dust deposition gauges
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment (renamed to DPE on 21 December 2021)
Eco Precinct	Woodlawn Eco Precinct
ED	Evaporation Dam
EIS	Environmental Impact Statement
enHealth	Department of Health
EfW	Energy from Waste
EA	Economic Assessment
EMM	EMM Consulting Pty Limited
EMPs	environmental monitoring programs
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environmental Protection Licence
ERF	energy recovery facility
ESD	Ecological Sustainable Development
EU	European Union
FFDI	Forest Fire Danger Index
FGT	Flue Gas Treatment
FOGO	food organics and garden organics
FTE	Full Time Equivalent
GDR	Great Dividing Range
GHG	Greenhouse Gas
GLC	Ground Level Concentrations
GM LEP	Goulburn Mulwaree Local Environmental Plan
Golder	Golder Associates Pty Ltd
GSW	General Solid Waste
HAA	Historical Archaeological Assessment
HHRA	human health risk assessment
HI	Hazard Index

IAIA	International Association for Impact Assessment
IBA	incinerator bottom ash
IBRA	Interim Biogeographic Regionalisation of Australia
ICNG	*Interim Construction Noise Guideline*
IFC	International Finance Corporation
IMF	Crisps Creek Intermodal Facility
ktpa	kilotonne per annum
LCA	Lifecycle Analysis
LCRMP	Landfill Closure and Rehabilitation Management Plan
LFG	landfill gas
LGA	Local Government Area
LHD	Local Health District
LPB	liquid paperboard
LOI	Loss of Ignition
LTP	leachate treatment plant
LVIA	Landscape and Visual Impact Assessment
MBT	Woodlawn Mechanical Biological Treatment Facility
MNES	Matter of National Environmental Significance
MOP	Mining Operations Plan
MJ/kg	Megajoules per *kilo*gram
MRF	materials recycling facility
MRL	Maximum Residue Limits
MSW	municipal solid waste
Mtpa	Million tonnes per annum
MW	Mega watt
Mwe	Megawatt electricity
MWth	Megawatt thermal
NCC	National Construction Code
NEPC	National Environment Protection Council
NGER	National Greenhouse and Energy Reporting
NMLs	Noise Management Levels
NPfI	Noise Policy for Industry
NPI	National Pollutant Inventory
NRAR	Natural Resources Access Regulator
NVIA	Noise and Vibration Impact Assessment

NW Policy	National Waste Policy
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposits
PET	polyethylene terephthalate
PHA	preliminary hazard analysis
PNTL	project noise trigger level
POP	Proof of Performance
POEO Act	*Protection of the Environment Operations Act 1997*
PSM	Permanent Survey Mark
RAPs	Registered Aboriginal Parties
RBL	rated background level
RNP	Road Noise Policy
RSD	Regionally Significant Development
SCIMS	Survey Control Information Management System
SCR	Selective Catalytic Reduction
SEARs	Secretary's Environmental Assessment Requirements
SEIFA	Socio-Economic Indexes for Areas
SEPP	State Environmental Planning Policy
SIA	social impact assessment
SML	Special Mining Lease
SNCR	Selective non-Catalytic Reduction
SSD	State significant development
SWIA	Surface Water Impact Assessment
TADPAI	Tarago and District Progress Association Incorporated
TIA	Traffic Impact Assessment
TOC	Total Organic Carbon
tpa	tonnes per annum
Veolia	Veolia Environmental Services (Australia) Pty Ltd
VPA	Voluntary Planning Agreement
WARR Act	*Waste Avoidance Resource and Recovery Act 2001*
WASMS	Waste and Sustainable Materials Strategy 2021
WARR Strategy	*Waste Avoidance and Resource Recovery Strategy 2014-2021*
WAL	Water Allocation Licence
WM Act	Water Management Act 2000
WSP	Water Sharing Plan

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