

ADVANCED RESOURCE RECOVERY CENTRE

ENVIRONMENTAL ASSESSMENT REPORT

Supporting Report for a Local
Government Infrastructure Designation

Version 3 – Revised in response to State
Agency Information Requests

March 2026

CITY OF
GOLDCOAST.TM



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Glossary of Terms, Abbreviations, and Acronyms

3D	Three-dimensional
ABL	Assessment background level (noise)
(the) Action	The proposed ARRC development in the context of the EPBC Act
AEP	Annual exceedance probability
ADT	Average Daily Traffic
ADPs	Accepted Development Provisions
(m)AHD	(meters above) Australian Height Datum
APACs	Air pollutant assessment criteria
APCr	Air Pollution Control Residue
AQMS	Air quality monitoring station
AQOs	Acoustic Quality Objectives
ARRC	Advanced Resource Recovery Centre
ASLP	Australian Standard Leaching Procedure
ASS	Acid sulfate soils
BAT	Best available techniques
BoM	Australian Bureau of Meteorology
BREFs	Best Available Techniques Reference Documents
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes, and Naphthalene
C&D	Construction and demolition (waste)
C&I	Commercial and industrial (waste)
CEMP	Construction Environmental Management Plan
City	Council of the City of Gold Coast
city	Gold Coast Local Government Area

City Plan	City of Gold Coast City Plan, version 11 – 6 February 2024
CLR	Queensland Government Contaminated Land Register
CO ₂	Carbon dioxide
CoP	Code of Practice
CoPC	Contaminants of Potential Concern
CSM	Conceptual Site Model – developed for contaminated land investigations
DAWTSIPM	Department of Women, Aboriginal and Torres Strait Islander Partnership and Multiculturalism
dB	Decibel
dBA	A-weighted decibel level
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DETSI	Queensland Department of Environment, Tourism, Science and Innovation
DFE	Defined flood event
DO	Dissolved Oxygen
DSDIP	Queensland Department of State Development, Infrastructure and Planning
DSITIA	Queensland Department of Science, Information Technology, Innovation and the Arts
EA	Environmental Authority
EAR	Environmental Assessment Report
EC	Electrical Conductivity
EF	Emissions factors
EfW	Energy from Waste
EMR	Queensland Government Environmental Management Register
EO Act	<i>Environmental Offsets Act 2014 (Qld)</i>
EP Act	<i>Environment Protection Act 1996 (Qld)</i>

EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPP Air	Environmental Protection (Air) Policy 2019 (Qld)
EPP Noise	Environmental Protection (Noise) Policy 2019 (Qld)
EPP Water and Wetlands	Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (Qld)
ERAs	Environmentally Relevant Activities
EVs	Environmental Values
FCEVs	Hydrogen Fuel Cell Vehicles
FOGO	Food organics and green organics waste
GED	General Environmental Duty (as defined by the EP Act)
GHG	Greenhouse gas(es)
GJ	Gigajoules
GTIA	“Guide to Traffic Impact Assessment” (December 2018) – Transport and Main Roads
GWP100	Global Warming Potential over a 100-year period
HAT	Highest astronomical tide
HVR	High-value regrowth
IBA	Incinerator Bottom Ash
IBAA	Incinerator Bottom Ash Aggregate
ILCD	International Life Cycle Data system
IPCC	Intergovernmental Panel on Climate Change
kL	Kilolitre
kph	Kilometre per hour
kWh	Kilowatt hour
LCC	Logan City Council

LCA	Lifecycle Assessment
LGID	Local Government Infrastructure Designation
LGIP	Local Government Infrastructure Plan
LGMS	Local Growth Management Strategy
LOR	Limit of reporting
MEIAs	Major Enterprise and Industrial Areas
MID	Ministerial Infrastructure Designation
Minister's Guidelines	Minister's Guidelines and Rules – Under the Planning Act 2016, version 3.0
MLES	Matters of Local Environmental Significance
MNES	Matters of National Environmental Significance
MRAS	Medium rate activated sludge
MRF	Material Recovery Facility
MSES	Matters of State Environmental Significance
MSW	Municipal solid waste
MUSIC	Model of Urban Stormwater Improvement Conceptualisation
MW	Mega Watts
NATA	National Association of Testing Authorities
NCA	Noise Catchment Area
NC Act	<i>Nature Conservation Act 1992 (Qld)</i>
NDD	Non-destructive drilling
NEPC	National Environment Protection Council
NEPC Act	<i>National Environment Protection Council Act 1994 (Cth)</i>
NEPMs	National Environment Protection Measures
NGA	Australian National Greenhouse Accounts

NPI	National Pollutant Inventory
NT Act	<i>Native Title Act 1993 (Cth)</i>
NVIA	Noise and Vibration Impact Assessment
OCF	Odour control facility
OCP	Organochlorine pesticide
OER	Odour emission rate
OLM	Ozone Limiting Method
OMP	Offsets Management Plan
OPP	Organophosphorus pesticide
ou	Odour Units
PAH	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionisation detector
Planning Act	<i>Planning Act 2016 (Qld)</i>
Planning Reg	<i>Planning Regulation 2017 (Qld)</i>
ppm	Parts per million
PTA	Primary Treatment Area
RAS	Return activated sludge
RBL	Rating background noise level
RCC	Redlands City Council
REs	Regional Ecosystems
RECs	Regional Economic Clusters
REPs	Recycling Enterprise Precincts

RL	Relative Level
SARA	State Assessment and Referral Agency
SEQ	South East Queensland
SETAC	Society of Environmental Toxicology and Chemistry
ShapingSEQ 2023	South East Queensland Regional Plan 2023
SIA	Significant Impact Assessment (EPBC Act)
SLA	Service Level Agreement
SOER	Surface odour emission rate
SOM	Soil organic matter
SPP	Queensland State Planning Policy, July 2017
SVOCs	Semi-volatile organic compounds
TAPM	The Air Pollution Model (CSIRO)
TCEQ-ESLs	Texas Commission on Environmental Quality Effects Screening Levels
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total dissolved solids
TEC	Threatened Ecological Community
TIA	Traffic Impact Assessment
TMR	Queensland Department of Transport and Main Roads
TOPA	Total oxidisable precursor assay
tpa	Tonnes per annum
TRH	Total recoverable hydrocarbons
TSS	Total suspended solids
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency

UV	Ultraviolet
VOCs	Volatile Organic Compounds
VM Act	<i>Vegetation Management Act 1999 (Qld)</i>
WFMS	Woongoolba Flood Mitigation Scheme
WHO	World Health Organization
WQOs	Water Quality Objectives
WRCs	Waste recycling centres
WSUD	Water Sensitive Urban Design
WT	Waste Treatment
Residual WtE	Residual Waste to Energy
Zero Waste Plan	City of Gold Coast's <i>Towards Zero Waste 2025 – 2028 Waste Management Plan</i>

Executive Summary

The City collects and manages the Gold Coast (city)'s solid waste via two operational landfills. With the city's population expected to exceed one million by 2041, the City has undergone significant assessment of the existing infrastructure capacity and land availability. The City's two operational landfills – Stapylton and Reedy Creek – are projected to reach capacity in the mid-2030s as a result of the rapid population growth in the region. An assessment of land availability conducted in 2022 noted that there was no suitable land available in the city for either landfill expansion or a new landfill. Furthermore, it is not in the City's interest to continue managing waste through landfill, and instead seeks innovative, globally relevant, sustainable, and lower carbon methods for municipal waste management.

The ARRC seeks to provide socially acceptable, and environmentally and financially sustainable resource recovery and residual waste solutions that remove the city's reliance on landfill and maximises the circular economy outcomes for the City. The City aims to deliver and operate a best practice resource recovery precinct which meets the long-term needs of the City and community, and aligns with social, environmental, and regulatory requirements in a financially responsible manner. The City's key objectives include:

- **Social licence to operate:** minimise waste disposal costs, demonstrate safe, thoughtful, and sustainable operation, providing long term opportunities for local businesses and the community.
- **Value for money:** Draw on Australian and international expertise to design, deliver, and operate the ARRC precinct through the application of value management, innovation, and sustainable construction and operation practices.
- **Environmental protection:** Reduce the City's carbon footprint from managing waste, achieve international best practice on plant operational performance, and achieve and Infrastructure Sustainability Rating for the facility.
- **Future-proof the city:** Implement a solution which adapts to the future needs of the city, including changing waste volumes and characteristics with a safe, sustainable, and smart solution.

The ARRC precinct comprises eight specially designed facilities that deliver an integrated circular economy precinct. Through the precinct, the City aims to achieve 35 per cent lower whole of life costs compared with transporting and landfilling waste. In doing so, the ARRC precinct will deliver a net carbon dioxide (CO₂) equivalent emissions reduction of 150,000 tonnes annually by incorporating local organics processing, reducing reliance on landfilling and coal-produced energy, and utilising hydrogen fuel for heavy fleet vehicles. The City's need to provide critical community infrastructure and sanitation services shall be met through adapting and innovating waste management practices to separate at source, as much as possible, recoverable resources in a sustainable and economical manner. The seven facilities are proposed as follows:

- 1) **Innovation Park:** The Innovation Park is a dedicated area of the precinct for recycling and sustainability focussed businesses to co-locate with the ARRC. The intention of the Innovation Park is to enable innovative and sustainable growth and entrepreneurship in the circular economy industry that will facilitate the continuous improvement of recoverable material recycling and reuse. The Innovation Park will be developed as individual units that can be developed and adapted to suit each tenant.

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- 2) **Green hydrogen electrolysis plant:** Recycled water from neighbouring process water producers will be converted through electrolysis into hydrogen, which will supply a refuelling station for the City's waste collection and transporting fleet. The conversion of the City's fleet to hydrogen is a significant step towards achieving the City's Net Zero Plan.
 - 3) **Recycling facility:** A Materials Recovery Facility (MRF) will receive the city's yellow-top recycling bins from kerbside collection. The MRF will use new technologies to reduce contamination when sorting and increase the amount of recycled material that can be used to produce new products, such as glass, paper, and remanufactured plastics (e.g., traffic bollards).
 - 4) **Construction and demolition waste recycling facility:** Recyclable construction and demolition materials will be processed into reusable materials, such as metals, concrete, asphalt, timber, and soils. Materials may be on sold to the construction industry and/or utilised in City projects to improve the sustainability of the City's construction footprint and truly deliver a circular economy.
 - 5) **Organics processing facility:** Organic waste shall be collected and processed in a closed environment using in-vessel composting technology. In-vessel composting reduces greenhouse gas emissions through decomposition occurring in an enclosed environment and enables increased diversion of organics from landfill, which are one of the primary emitters of fugitive emissions such as methane. Organics received at the facility will be converted to new products, such as compost and mulch. The facility will be capable of processing food organics and green organics.
 - 6) **Residual waste to energy facility:** The Residual WtE facility is the end of lifecycle for any residual waste materials that cannot be recovered and reprocessed. Residual waste will be thermally treated in a moving grate furnace to create steam that turns turbines to generate energy. The energy generated by the Residual WtE facility will offset 100 percent of the City's operational energy requirements, as well as power the ARRC precinct. Bottom ash recovered after thermal treatment will be collected for beneficial reuse, with metals extracted for further recycling and the residual ash converted to aggregate for use in road base and concrete products.
 - 7) **Community education centre:** Community behavioural change and education is critical to the success of the circular economy. Embedded inside the ARRC, this centre will provide resources and information to schools and interested groups. It will also support training, education, and research opportunities to further establish the precinct as a leading sustainability hub.

The ARRC is proposed to be built in stages across seven adjacent City-owned lots, with the entire project fully commissioned and operational by 2032. Due to the community-critical nature of the ARRC, the staged approach for development, and the number of properties the ARRC will encompass, a decision by the City to deliver the ARRC under a Local Government Infrastructure Designation (LGID) has been made.

This Environmental Assessment Report (EAR – this report) provides a comprehensive assessment of the Queensland State planning requirements, specifically addressing the requirements of the *Minister's Guidelines and Rules – Under the Planning Act 2016, version 3.0* for making an LGID, the impacts of the LGID to the local Planning Scheme of the Gold Coast, Commonwealth requirements, and provide a comprehensive preliminary environmental impact assessment of the ARRC's proposed master plan and early basis of design, to identify areas where specific controls and mitigations may be required to ensure the ARRC complies with Commonwealth and State legislation, and minimises harm to the environment.

1. Introduction

The City collects and manages the Gold Coast (city)'s solid waste via two operational landfills. With the city's population expected to exceed one million by 2041, the City has undergone significant assessment of the existing infrastructure capacity and land availability. The City's two operational landfills – Stapylton and Reedy Creek – are projected to reach capacity in the mid-2030s as a result of the rapid population growth in the region. An assessment of land availability conducted in 2022 noted that there was no suitable land available in the city for either landfill expansion or a new landfill. Furthermore, it is not in the City's interest to continue managing waste through landfill, and instead seeks innovative, globally relevant, sustainable, and lower carbon methods for municipal waste management.

The ARRC seeks to provide socially acceptable, and environmentally and financially sustainable resource recovery and residual waste solutions that remove the city's reliance on landfill and maximises the circular economy outcomes for the City. The City aims to deliver and operate a best practice resource recovery precinct which meets the long-term needs of the City and community, and aligns with social, environmental, and regulatory requirements in a financially responsible manner. The City's key objectives include:

- **Social licence to operate:** minimise waste disposal costs, demonstrate safe, thoughtful, and sustainable operation, providing long term opportunities for local businesses and the community.
- **Value for money:** Draw on Australian and international expertise to design, deliver, and operate the ARRC precinct through the application of value management, innovation, and sustainable construction and operation practices.
- **Environmental protection:** Reduce the City's carbon footprint from managing waste, achieve international best practice on plant operational performance, and achieve and Infrastructure Sustainability Rating for the facility.
- **Future-proof the city:** Implement a solution which adapts to the future needs of the city, including changing waste volumes and characteristics with a safe, sustainable, and smart solution.

The ARRC precinct comprises seven specially designed facilities that deliver an integrated circular economy precinct. Through the precinct, the City aims to achieve 35 per cent lower whole of life costs compared with transporting and landfilling waste. In doing so, the ARRC precinct will deliver a net carbon dioxide (CO₂) equivalent emissions reduction of 150,000 tonnes annually by incorporating local organics processing, reducing reliance on landfilling and coal-produced energy, and utilising hydrogen fuel for heavy fleet vehicles. The City's need to provide critical community infrastructure and sanitation services shall be met through adapting and innovating waste management practices to separate at source, as much as possible, recoverable resources in a sustainable and economical manner.

The ARRC is proposed to be built in stages across eight adjacent City-owned lots, with the entire project fully commissioned and operational by 2032. Due to the community-critical nature of the ARRC, the staged approach for development, and the number of properties the ARRC will encompass, a decision by the City to deliver the ARRC under a Local Government Infrastructure Designation (LGID) has been made.

This Environmental Assessment Report (EAR – this report) provides a comprehensive assessment of the Queensland State planning requirements, specifically addressing the requirements of the *Minister's Guidelines and Rules – Under the Planning Act 2016, version 3.0* for making an LGID, the impacts of the LGID to the local Planning Scheme of the Gold Coast, Commonwealth requirements, and provide a comprehensive preliminary environmental impact assessment of the ARRC's proposed master plan and early basis of design, to identify areas where specific controls and mitigations may be required to ensure the ARRC complies with Commonwealth and State legislation, and minimises harm to the environment.

2. Statutory Context

2.1 Introduction

Infrastructure designations are administered under the *Planning Act 2016* (Planning Act) and are either a decision (designation) made by the State Planning Minister (the Minister) as a Ministerial Infrastructure Designation (MID) or by a local government authority (an LGID). Designations enable land for essential community infrastructure (defined in Schedule 5 of the *Planning Regulation 2017* (Planning Reg)) so that the needs of an area, region, or the state can be met.

2.2 Legislative Context and Framework

While the implementation of an LGID over the designation premises classifies development as “accepted development” and, therefore, enables most work to proceed without further approval, any activities that trigger requirements without Accepted Development Provisions (ADPs), or actions that are considered significant under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) still require rigorous assessment and, where applicable, approval outside of the LGID process.

2.2.1 Commonwealth Legislation

Two commonwealth instruments are specifically relevant to the designation of infrastructure on the premises subject of this EAR.

- EPBC Act
- Native Title Act 1993 (NT Act)

Any development on the premises subject to designation must be carried out in a manner that seeks to avoid significant impact to Matters of National Environmental Significance (MNES) and native title. Where impacts are unavoidable and determined to be significant under the definition of the EPBC Act or NT Act, referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) will be required. Designation of infrastructure development does not exempt such from this process.

2.2.2 State Legislation

In Queensland, there are three key State planning instruments that set out the requirements for designating premises for the development of designated infrastructure.

- Planning Act
- Planning Reg
- Minister’s Guidelines and Rules – Under the Planning Act 2016, version 3.0 (Minister’s Guidelines)

More details on these planning instruments are provided in the subsections that follow.

In addition to the State planning instruments, there are numerous legislation that must be considered and properly assessed for any development on designated premises, including:

- *Aboriginal Cultural Heritage Act 2003*
- *Building Act 1975*
- *Environmental Protection Act 1996* (EP Act)

-
- *Environmental Offsets Act 2014* (EO Act)
 - *Nature Conservation Act 1992* (NC Act)
 - *Queensland Heritage Act 1992*
 - *Transport Infrastructure Act 1994*
 - *Vegetation Management Act 1999* (VM Act)
 - *Water Act 2000*

A full assessment of these instruments and their associated regulations and policies has been conducted as specifically applicable to this LGID and is addressed in Section 3.2

2.2.3 Queensland's Planning System and Regulatory Framework

Queensland's state planning system comprises five main components:

- 1) Legislated requirements via the Planning Act and the Planning Reg, and the *Regional Planning Interests Act 2014* and *Regulation 2014*.
- 2) State planning requirements, including the State Planning Policy, July 2017 (SPP) and regional plans.
- 3) Development requirements, including State Development Assessment Provisions (SDAP), relevant regulatory provisions in the Planning Reg, and local planning instruments, including planning schemes and policies.
- 4) Development assessment processes and decisions.
- 5) Development delivery (post-approval)

Figure 1 provides an illustrative process diagram of Queensland's planning system as described above.

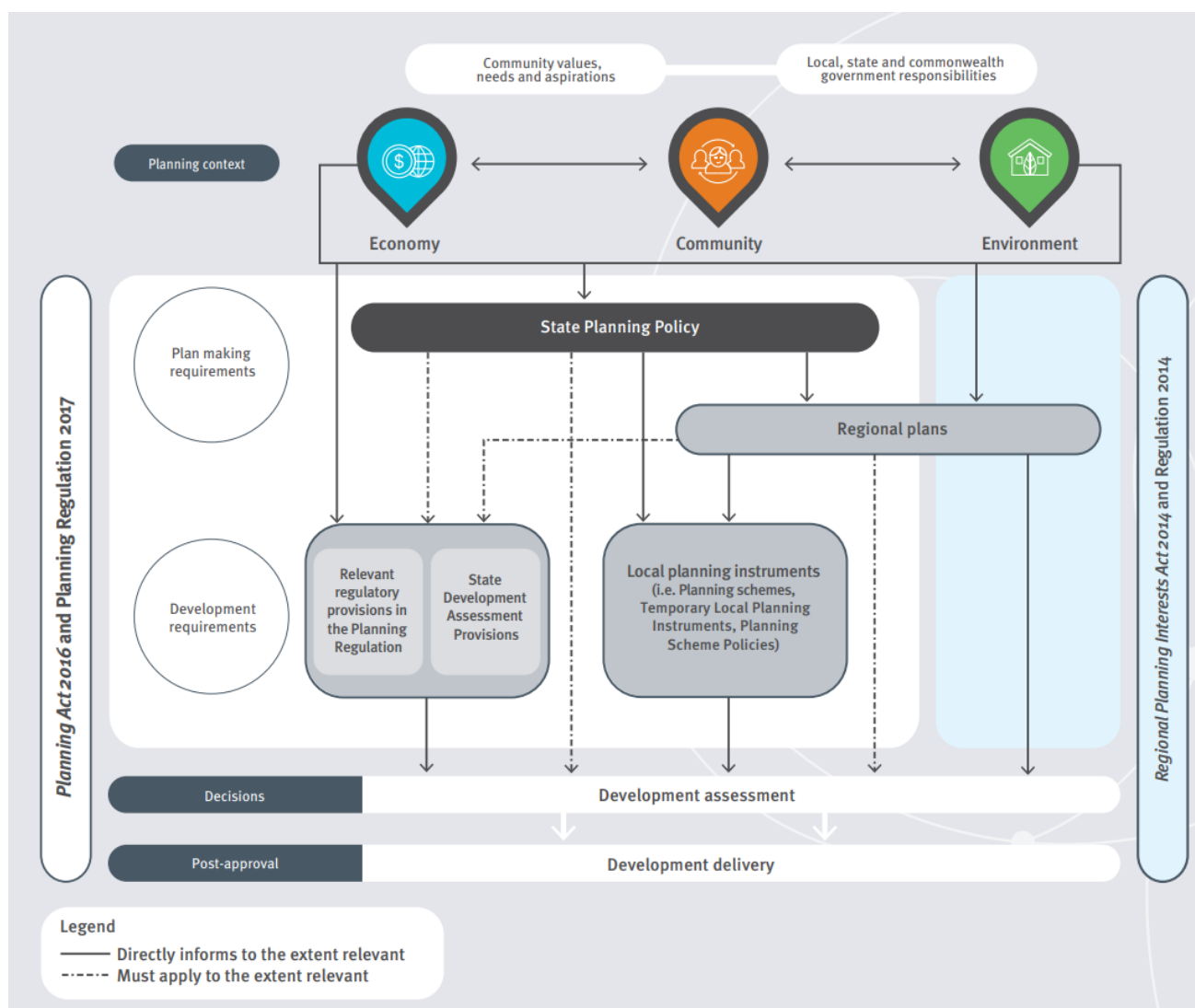


Figure 1 The Queensland planning system (SPP 2017)

Infrastructure designation in Queensland is an instrument administered and regulated by the Planning Act, the Planning Reg, and detailed within the Minister's Guidelines. The following subsections provides details regarding the role these legislations play in the designation process.

Planning Act

Part 5 of the Planning Act sets out the definition of a designation, the criteria and process for making designations, the duration of designation, repeals processes, requirements for noting designations in planning schemes, and processes for amending designations.

Section 35 defines a designation under the Act and provides information as to the types of requirements that may be applied to the designation, such as the works for the infrastructure, the use of the premises, operating times and limitations, applicable ancillary uses, and management measure to mitigate risk (including environmental). Section 36 sets out the criteria for making or amending designations. This includes the aspects of the proposal that must be satisfied for the designation to be issued, including environmental assessments and adequate consultation. Section 37 sets out the process for making or amending a designation.

Sections 36 and 37 allow for the Minister's Guidelines which are further detailed in subsequent sections and set out specific requirements for making or amending various applications (see further detail below).

Planning Reg

Schedule 5 of the Planning Reg sets out infrastructure definitions for which designations may be made. Part 1 includes 'Infrastructure for Transport' and Part 2 includes 'Other Infrastructure', which states '(18) Waste Management Facilities' and '(19) Water Cycle Management Infrastructure' as community infrastructure types applicable for designation that are relevant to the subject of this LGID EAR.

Part 2 Division 4 of the Planning Reg prescribes reference to the Minister's Guidelines as the mechanism and instruction for preparing and making designations. It references Schedule 5 (13), as well as the Guidelines (15), and the requirement to complete an environmental assessment and consultation (14).

Minister's Guidelines and Rules

The Guidelines set out specific requirements for making or amending various applications, including changes to the planning scheme, the local government infrastructure plan (LGIP), and rules around the LGID process (Chapter 8 of the Minister's Guidelines).

2.2.4 State Planning Instruments

State Planning Instruments are identified in Section 8 of the Act. They are defined as:

"(2) A State planning instrument is a planning instrument made by the Minister to protect or give effect to State interests, and is either –

- (a) A State planning policy (including temporary State planning policy); or
- (b) A regional plan."

For the purposes of this report and associated proposed designation, the following State planning instruments apply:

- State Planning Policy
- South East Queensland Regional Plan 2023 (ShapingSEQ)

The following sections provides an assessment of the proposed designation against these two State planning instruments.

State Planning Policy

Queensland's SPP was given effect on 3 July 2017 with the purpose of expressing "the state's interests in land use planning and development" and the promotion of these state interests to inform development decisions at state and local government to "secure a liveable, sustainable and prosperous Queensland". State interests are defined under the Act as an interest that the Minister considers:

- Affects an economic or environmental interest of the state or a part of the state
- Affects the interest of ensuring that the purpose of the Act is achieved.

The SPP sets down the state's interests that apply to plan making to assist local governments in developing planning schemes that meet the intent of integrated state, regional, and local planning, and development

assessment policies for the local government area in their responsibility. The SPP applies (to the extent where relevant) when:

- a) Making or amending a local planning instrument
- b) Making or amending a regional plan
- c) Designating premises for infrastructure
- d) Local government is assessing a development application, if its planning scheme has not yet appropriately integrated the relevant SPP state interest policies
- e) An assessment manager or referral agency other than local government is assessing a development application

In the case where the SPP applies to designating premises for infrastructure, the Minister and/or local government must have regard to all parts of the SPP. Table 1 provides an overview of the Parts of the SPP and the relevant reference to the detail contained within this EAR.

Table 1 SPP Relevant Parts and References

	Part A	Part B	Part C	Part D	Part E	Part F	Part G
Part Purpose	Introduction and context	Application and operation	Purpose and guiding principles	State interest statements	State interest policies and assessment benchmarks	Glossary	<p>Appendix 1 – Categories of mapping layers (SPP Interactive Mapping System)</p> <p>Appendix 2 – Stormwater management design objectives</p>
Applicability	For information only	For information only	Applicable	Applicable	Applicable	For information only	<p>Appendix 1 – for information only</p> <p>Appendix 2 - Applicable</p>
Report Reference	N/A	N/A	Purpose and Guiding Principles	State Interest Statements, Policies, and Assessment Benchmarks	State Interest Statements, Policies, and Assessment Benchmarks	N/A	<p>Appendix 1 – N/A</p> <p>Appendix 2 – Environmental Impact Assessment and Management</p>

Purpose and Guiding Principles

The SPP includes five guiding principles that assist in making processes and development decisions. These exist in conjunction with the state interests and ensure that development and the planning system is:

- Outcome focused – clearly focused on the delivery of outcomes
- Integrated – reinforcing the role of local planning schemes as the integrated, comprehensive statement of land use policy and development intentions for a local area
- Efficient – support the efficient determination of appropriate development
- Positive – enable positive responses to change, challenges, and opportunities
- Accountable – promote confidence in the planning system through plans and decisions that are transparent and accountable.

Table 2 provides a summary of how this report and LGID request addresses and meets each guiding principle. The assessment completed confirms that the LGID request and this report comply with the Guiding Principles of the SPP.

Table 2 Guiding Principles and this LGID request

Category	Guiding Principle	Response
Outcome Focused	<p>Clearly focus on the delivery of outcomes:</p> <ul style="list-style-type: none"> Plans and development outcomes integrate and balance the economic, environmental, and social needs of current and future generations in order to achieve ecological sustainability. Plans express clear performance outcomes for development, supported by a range of acceptable outcomes, where possible. Innovative and flexible approaches to design and development are supported and encouraged when consistent with a plan's strategic intent. Decision making ensure that, where acceptable, when outcomes are satisfied by development, then the relevant performance outcome is taken to be satisfied in full. Performance outcomes may still be satisfied, even though an associated acceptable outcome is not met. Plans and development outcomes support stated objectives, needs, and aspirations of the community at the state, regional, and local level. 	<p>This LGID proposal sets out a request to designate the subject land to facilitate the development of the ARRC. The infrastructure proposed facilitates the delivery of the City's commitment to sustainable development and Net Zero Waste Plan through enabling greater diversion of waste from landfill, which provides improved environmental outcomes through the reduction of waste and the increase of resource recovery, and the ability for local and state businesses and manufacturers within the resource recovery and recycling industry to source recyclable materials in a manner that reduces contamination and separation risks.</p> <p>More details on the projects proposed within the subject land are provided in Section 3.1.1 .</p>

Category	Guiding Principle	Response
Integrated	<p>Reinforce the role of local planning schemes as the integrated, comprehensive statement of land use policy and development intentions for a local area:</p> <ul style="list-style-type: none"> Plans coordinate and integrate land use policy for a local area by considering: <ul style="list-style-type: none"> International agreements, such as the UNESCO world heritage listing of the Great Barrier Reef and Ramsar Convention National, state, regional, and local matters, to the extent relevant. Plans integrate land use, resource management, and infrastructure needs and considerations. Plans support a 15-year supply of land for development. The zoning on land reflects and responds to the characteristics of the land that constrain its use. Overlays should be compatible with and not operate either individually or cumulatively to prevent or restrict land from being used for the purpose for which it has been zoned. Plans include a performance-based assessment of development against a clear hierarchy of policies linked to the achievement of realistic and long-term strategic planning. 	<p>This proposal relates to the designation of infrastructure; therefore, reference to the creation and making of plans is not applicable.</p> <p>The proposed LGID responds to the current zoning of the subject land in the City Plan, which is currently not accurate for the land use in practice. This is covered in more detail in Section 2.3 .</p>

Category	Guiding Principle	Response
<p>Efficient</p>	<p>Support the efficient determination of appropriate development:</p> <ul style="list-style-type: none"> Plans and assessment processes result in development outcomes that are certain, responsive, and performance based. Plans regulate development only to the extent necessary to address potential impacts. When applied, plans adopt the lowest appropriate level of assessment required to efficiently and effectively address those impacts. The level of assessment for development is proportionate to the potential impacts and level or risk of the development being regulated and a plan's strategic intent and purpose of the relevant zone, local plan and/or precinct, for instance, development that is: <ul style="list-style-type: none"> Minor, low-risk, and that is encourage or contemplated in a zone should be identified as accepted development Consistent and in accordance with the broad intent of a zone and able to be assessed against assessment benchmarks, should be identified as code assessable development Contrary to the intent of a zone, requires public input or is unforeseen by a planning scheme, should be 	<p>The proposed LGID will facilitate the staged development of community recycling and waste infrastructure and development of the local circular economy market. By designating the subject land for such infrastructure and, ultimately, updating the zoning to reflect this, much of the development will fall under 'Accepted Development' provisions and enable the infrastructure to be constructed in a timely and efficient manner without the needs for multiple and length additional approvals (with the exception of those not considered under Accepted Development provisions).</p>

Category	Guiding Principle	Response
	identified as impact assessable development assessed against a broader range of matters.	
Positive	<p>Enable positive responses to change, challenges, and opportunities:</p> <ul style="list-style-type: none"> • Contemporary information, challenges, and community needs and aspirations are reflected through up-to-date plans. • Evidence and objectively assessed needs for a basis for planning that uses the best available knowledge. • Plans are written using clear, concise, and positive language to describe what outcomes are sought, required, or encouraged in a particular location, rather than what is to be avoided, prevented, or discouraged. • Community health and wellbeing, and resilience and adaptability to change (including economic change, social change, and climate change adaptation and mitigation), are promoted in plans and development outcomes. • Plans adopt a performance-based approach to development assessment to allow for innovation and flexibility in how development in a local area can be achieved. 	This proposal relates to the designation of infrastructure; therefore, reference to the creation and making of plans is not applicable.

Category	Guiding Principle	Response
	<ul style="list-style-type: none"> Plans are drafted to ensure that development is assessed on its individual merits. 	
Accountable	<p>Promote confidence in the planning system through plans and decisions that are transparent and accountable:</p> <ul style="list-style-type: none"> Plans and development outcomes reflect balanced community views and aspirations based on a clear understanding of the importance of the community's involvement in plan making. Plans resolve competing state and local interests through using an evidence-based approach, which balances community needs, views, and aspirations. Reasonable, logical, and fair development decisions are supported by clear and transparent planning schemes. Plans only seek to regulate land use and planning outcomes and do not address matters regulated outside of the planning system, for instance, building work regulated under the <i>Building Act 1975</i> (unless permitted). Obtaining access to planning information is simple and direct, capitalising on opportunities presented by information technology. 	<p>The proposed LGID will be undertaken according to 'Chapter 2 Planning' of the Act and 'Chapter 8 Local government infrastructure designation process rules' of the Minister's Guidelines. The proposed development and this report have considered relevant State and local planning instruments and integrated requirements where applicable and relevant.</p> <p>Stakeholder engagement and community notification has been included in this LGID and the details of the steps taken and to be taken are provided in Section 5 of this report.</p>

State Interest Statements, Policies, and Assessment Benchmarks

There are 17 state interests in land use planning and development expressed in the SPP that are to be considered in the context of the five guiding principles. These state interests are categorised under five themes: (1) Liveable communities and housing; (2) Economic growth; (3) Environment and heritage; (4) Safety and resilience to hazards; and (5) Infrastructure. These are shown in Figure 2.



Figure 2 State interests in land use planning and development (SPP 2017)

Table 3 sets out each of the state interests and how this LGID and report relates to them.

Table 3 Assessment of the LGID Proposal against State Interests

State Interest	Applicability	Reference
Planning for Liveable Communities and Housing		
Liveable Communities	Not Applicable	-
Housing Supply and Diversity	Not Applicable	-
Planning for Economic Growth		
Agriculture	Not Applicable	-

State Interest	Applicability	Reference
Development and Construction	Assessed	Construction Environmental Management
Mining and Extractive Resources	Assessed	Key Resource Areas and Transport Routes
Tourism	Not Applicable	-
Planning for Environment and Heritage		
Biodiversity	Assessed	Flora and Fauna
Coastal Environment	Not Applicable	-
Cultural Heritage	Assessed	Cultural Heritage and Native Title
Water Quality	Assessed	Surface Water and Hydrology and Geology and Groundwater
Planning for Safety and Resilience to Hazards		
Emissions and Hazardous Activities	Assessed	Contaminated Land, Air Quality and Odour, Noise, and Climate Change and Greenhouse Gases
Natural Hazards, Risk, and Resilience	Assessed	Natural Hazards and Risks and Climate Change and Greenhouse Gases
Planning for Infrastructure		
Energy and Water Supply	Assessed	Public Utilities
Infrastructure Integration	Assessed	Public Utilities
Transport Infrastructure	Assessed	Traffic and Transport
Strategic Airports and Aviation Facilities	Not Applicable	-
Strategic Ports	Not Applicable	-

The SPP prescribes assessment benchmarks for each state interest and state interest policies. The assessment benchmarks for the state interests assessed (as listed in Table 3) are listed and described in Table 4.

Table 4 Assessment Benchmarks

State Interest and Benchmarks	State Interest Policies	Response
Planning for Economic Growth		
<p>Development and Construction</p> <p><i>Employment needs, economic growth, and a strong development and construction sector are supported by facilitating a range of residential, commercial, retail, industrial, and mixed-use development opportunities.</i></p>	<p>1) A sufficient supply of suitable land for residential, retail, commercial, industrial, and mixed-use developments is identified that considered:</p> <ul style="list-style-type: none"> a. Existing and anticipated demand b. The physical constraints of the land c. Surrounding land uses d. The availability of, and proximity to, essential infrastructure required to service and support such development. 	<p>The proposed ARRC will be constructed in stages to accommodate local growth in the Stapylton-Yatala industrial development area and the ability of the construction industry to accommodate ARRC precincts within the broader development of the Gold Coast and South East Queensland region. Required infrastructure upgrades to accommodate the development have been considered, designed, and are discussed in more detail in Traffic and Transport and Public Utilities.</p> <p>As such, the proposed LGID is considered consistent with the outcomes sought.</p>
	<p>2) Appropriate infrastructure required to support all land uses is planned and provided.</p>	<p>Required infrastructure upgrades to accommodate the development have been considered, designed, and are discussed in more detail in Traffic and Transport and Public Utilities.</p> <p>As such, the proposed LGID is considered consistent with the outcomes sought.</p>
	<p>3) Mixed use development is achieved by appropriately zoning the land.</p>	<p>Currently the land zoning in the City Plan does not adequately accommodate the development in the preferred format. This is the motivation for the proposed LGID.</p>

State Interest and Benchmarks	State Interest Policies	Response
		As such, the proposed LGID is considered consistent with the outcomes sought.
	4) An appropriate mix of lot sizes and configurations for residential, retail, commercial, mixed-use, and ancillary activities.	Not applicable – the development is not related to subdivision development.
	5) Efficient delivery of development is facilitated by the adoption of the lowest appropriate level of assessment for development that is consistent with the purpose of the zone.	<p>The purpose of this LGID is to enable the development to progress as Accepted Development under the Act.</p> <p>As such, the proposed LGID is considered consistent with the outcomes sought.</p>
	6) Land uses are consistent with the purpose of the zone.	<p>Currently the land zoning in the City Plan does not adequately accommodate the development in the preferred format. This is the motivation for the proposed LGID.</p> <p>As such, the proposed LGID is considered consistent with the outcomes sought.</p>
	<p>7) State development areas and Priority Development Areas are:</p> <p>a. Identified and appropriately considered in terms of their planning intent</p>	The subject land does not occur with a state development area or Priority Development Area. Therefore, this is not applicable.

State Interest and Benchmarks	State Interest Policies	Response
	b. Supported by compatible and complementary land uses and services on surrounding land.	
	8) Public benefit outcomes on state-owned land are achieved by appropriately zoning the land.	The subject land is owned by the City and, therefore, this is not applicable.
Mining and Extractive Resources <i>Extractive resources are protected and mineral, coal, petroleum and gas resources are appropriately considered to support the productive use of resources, a strong mining and resource industry, economical supply of construction materials, and avoid land use conflicts where possible.</i>	1) Development within a resource/processing area of a KRA will not impede the undertaking of an existing or future extractive industry development.	The development of the ARRC is not expected to impede the undertaking of current or future extractive industry activities or development. The development of the ARRC is considered appropriate adjacent industry to extractive industries and current land uses (waste management).
	2) Development of sensitive land uses and other potentially incompatible land uses is avoided within the separation area for a resource/processing area of a KRA, if it could impede the extraction of the resource.	The development of the ARRC is not considered a sensitive land use. The Community Education Centre component of the development will be located outside of the KRA and KRA separation areas, including transport and transport separation areas.
	3) Development not associated with extractive industry in the transport route separation area of a KRA does not increase the number of people working or residing in the transport route separation area unless the development mitigates the impacts of noise, dust, and	The ARRC development will maintain vegetation buffers around the perimeter of the site, which will protect workers at the site from the KRA transport route and separation area, and limit development to being predominantly outside of the separation area. Due to the nature of the ARRC development, additional controls will be in place to protect

State Interest and Benchmarks	State Interest Policies	Response
	vibration generated by the haulage of extractive materials along the transport route.	workers from dust, noise, and vibration generated within the development, as well as within the KRA transport route.
	4) Development adjacent to the transport route does not adversely affect the safe and efficient use of the transport route by vehicles transporting extractive resources.	The ARRC development will require the upgrade of a number of transport routes within the Stapylton area, including those mapped as KRA transport routes. This will be further developed in consultation with the State Government, Council, and relevant stakeholders as part of a detailed TIA once the designs of the precinct and each facility are further developed.
Planning for Environment and Heritage		
<p>Biodiversity</p> <p><i>Matters of environmental significance are valued and protected, and the health and resilience of biodiversity is maintained or enhanced to support ecological processes.</i></p>	<p>1) Development is located in areas to avoid significant impacts on matters of national environmental significance and considers the requirements of the <i>Environment Protection and Biodiversity Conservation Act 1999</i>.</p>	<p>A number of the lots proposed in this EAR for LGID have environmental values consistent with Matters of National Environmental Significance (MNES) under the EPBC Act. The proposed ARRC footprint, encompassing all lots proposed in this EAR for designation, have been surveyed and assessed, with the findings detailed in Flora and Fauna. The assessment of this land concluded that the development will have an impact on MNES and has been referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for assessment. The design has considered the key areas of vegetation and alternatives, avoidance, and mitigation have been incorporated into the design footprint where feasible. Further discussion of the mitigation measures, including offsets, are discussed in Flora and Fauna.</p>

State Interest and Benchmarks	State Interest Policies	Response
		DCCEEW have determined the ARRC to be a Controlled Action and will assess the Action via the <i>Assessment by Preliminary Information</i> process.
	2) Matters of state environmental significance are identified and development is located in areas that avoid adverse impacts; where adverse impacts cannot be reasonably avoided, they are minimised.	A number of the lots proposed in this EAR for LGID have environmental values consistent with Matters of State Environmental Significance (MSES). The proposed ARRC footprint, encompassing all lots proposed in this EAR for designation, have been surveyed and assessed, with the findings related to ecological MSES detailed in Flora and Fauna, potentially impacted waterways in Surface Water and Hydrology, and cultural heritage impacts in Cultural Heritage and Native Title. Where ADPs do not apply to MSES via the LGID process, additional approvals may be required. These are further discussed in State Development Assessment Provisions.
	3) Matters of local environmental significance are identified and development is located in areas that avoid adverse impacts; where adverse impacts cannot be reasonably avoided, they are minimised.	MLES have been identified and impacts assessed as part of Flora and Fauna. The layout designs of the proposed development have considered the findings of surveys completed and worked to minimise the impact to MLES through minimising and mitigating impacts where they cannot be fully avoided.
	4) Ecological processes and connectivity is maintained or enhanced by avoiding fragmentation of matters of environmental significance.	Much of the vegetation in the proposed active operational area will require removal and offsetting as per EPBC approval conditions. Ecological surveys completed (see Flora and Fauna) indicate that the vegetation in the impacted area is not well connected to surrounding

State Interest and Benchmarks	State Interest Policies	Response
		fauna corridors or patches. As such, it is intended that some areas of vegetation are proposed to be retained in the project footprint to enable refuge for migratory and transient species only, but not for conservation purposes. More information is provided in Flora and Fauna.
	5) Viable koala populations in South East Queensland are protected by conserving and enhancing koala habitat extent and condition.	The ARRC project will impact approximately 41 ha of mapped koala habitat. Numerous ecological surveys completed over a period of several years (Flora and Fauna) indicate; however, that the lack of connectivity of the patch to well utilised and viable koala habitat suggests that the vegetation on site is not utilised. Regardless, referral to DCCEEW under the EPBC Act and the Controlled Action decision will see the 41 ha fully offset in accordance with the Commonwealth offsets requirements in an area close to the project site that reconnects viable koala populations across new patches and extended corridors. More information is provided in Flora and Fauna.
<p>Cultural Heritage</p> <p><i>The cultural heritage significance of heritage places and heritage areas, including places of Aboriginal and Torres Strait Islander cultural heritage, is conserved for the benefit of the community and future generations.</i></p>	1) Matters of Aboriginal cultural heritage and Torres Strait Islander cultural heritage are appropriately conserved and considered to support the requirements of the <i>Aboriginal Cultural Heritage Act 2003</i> and the <i>Torres Strait Islander Cultural Heritage Act 2003</i> .	Local Indigenous parties and Native Title claimants have been engaged to conduct an assessment of the site and the potential for Aboriginal cultural heritage to occur within the project area. The potential for impacts to occur to any unidentified heritage is addressed in Cultural Heritage and Native Title and via controls during Construction Environmental Management.
	2) Adverse impacts on the cultural heritage significance of world heritage properties and	The development does not occur within, adjacent to, or near any World Heritage properties or national heritage places.

State Interest and Benchmarks	State Interest Policies	Response
	national heritage place prescribed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> are avoided.	
	3) Adverse impacts on the cultural heritage significance of state heritage places are avoided.	Local Indigenous parties and Native Title claimants have been engaged to conduct an assessment of the site and the potential for Aboriginal cultural heritage to occur within the project area. The potential for impacts to occur to any unidentified heritage is addressed in Cultural Heritage and Native Title and via controls during Construction Environmental Management.
	4) Local heritage places and local heritage areas important to the history of the local government area are identified, including a statement of the local cultural heritage significance of the place or area.	Local Indigenous parties and Native Title claimants have been engaged to conduct an assessment of the site and the potential for Aboriginal cultural heritage to occur within the project area. The potential for impacts to occur to any unidentified heritage is addressed in Cultural Heritage and Native Title and via controls during Construction Environmental Management.
	5) Development of local heritage places or local heritage areas does not compromise the cultural heritage significance of the place or area by:	Local Indigenous parties and Native Title claimants have been engaged to conduct an assessment of the site and the potential for Aboriginal cultural heritage to occur within the project area. The potential for impacts to occur to any unidentified heritage is addressed in Cultural Heritage and Native Title and via controls during Construction Environmental Management..

State Interest and Benchmarks	State Interest Policies	Response
	<p>a. Avoiding adverse impacts on the cultural heritage significance of the place or area; or</p> <p>b. Minimising and mitigating unavoidable adverse impacts on the cultural heritage significance of the place or area.</p>	
	6) The conservation and adaptive reuse of local heritage places and local heritage areas are facilitated so that the cultural heritage significance is retained.	Local Indigenous parties and Native Title claimants have been engaged to conduct an assessment of the site and the potential for Aboriginal cultural heritage to occur within the project area. The potential for impacts to occur to any unidentified heritage is addressed in Cultural Heritage and Native Title and via controls during Construction Environmental Management.
<p>Water Quality</p> <p><i>The environmental values and quality of Queensland waters are protected and enhanced.</i></p>	1) Development facilitates the protection or enhancement of environmental values and the achievement of water quality objectives for Queensland waters.	The proposed development integrates protective management measures for managing stormwater and run-off during construction and operations into the overall design of the facilities. These measures are discussed in Surface Water and Hydrology and Geology and Groundwater and protections to be applied during construction are discussed in Construction Environmental Management.
	2) Land zoned for urban purposes is located in areas that avoid or minimise the disturbance to:	Assessments of environmental risk, particularly pertaining to high-risk soils, high ecological value aquatic ecosystems, groundwater dependent ecosystems, and natural drainage and landform have been completed and used to inform the design in a manner that seeks to avoid or

State Interest and Benchmarks	State Interest Policies	Response
	<ul style="list-style-type: none"> a. High risk soils b. High ecological value aquatic ecosystems c. Groundwater dependent ecosystems d. Natural drainage lines and landform features 	mitigate risk where possible. Further detail is provided in Flora and Fauna, Surface Water and Hydrology and Geology and Groundwater.
	<p>3) Development is located, designed, constructed, and operated to avoid or minimise adverse impacts on environmental values of receiving waters arising from:</p> <ul style="list-style-type: none"> a. Altered stormwater quality and hydrology b. Waste water (other than contaminated stormwater and sewage) c. The creation or expansion of non-tidal artificial waterways d. The release and mobilisation of nutrients and sediments 	<p>The proposed development integrates protective management measures for managing stormwater and run-off during construction and operations into the overall design of the facilities. These measures are discussed in Surface Water and Hydrology and protections to be applied during construction are discussed in Construction Environmental Management.</p> <p>Existing infrastructure and utilities will be upgraded and expanded to accommodate the development. This is further described in Public Utilities.</p> <p>No non-tidal artificial waterways will be created as part of the proposed development.</p> <p>Alterations to topography that has the potential to impact hydrology are discussed in Surface Water and Hydrology and Geology and Groundwater.</p>
	4) At the construction phase, development achieves the applicable stormwater	The design of the development considered Appendix 2 of the SPP to ensure compliance. Construction mitigation measures will be developed

State Interest and Benchmarks	State Interest Policies	Response
	management design objectives (Appendix 2 of the SPP).	on completion of detailed and 'for construction' design phases and will be covered in the documentation outlined in Construction Environmental Management.
	5) At the post-construction phase, development: <ul style="list-style-type: none"> a. Achieves the applicable stormwater management design objectives on-site (identified in Appendix 2 of the SPP); or b. Achieves an alternative locally appropriate solution off-site that achieves an equivalent or improved water quality outcome to the relevant stormwater management design objectives (in Appendix 2 of the SPP) 	The proposed development integrates protective management measures for managing stormwater and run-off during operations into the overall design of the facilities. These measures are discussed in Surface Water and Hydrology.
	6) Development in water resource catchments and water supply buffer areas avoids potential adverse impacts on surface waters and groundwaters to protect drinking water supply environmental values.	The development is not occurring in a water resource catchment or water supply buffer area.
Safety and Resilience to Hazard		
Emissions and Hazardous Activities	1) Industrial development, major gas, waste and sewerage infrastructure, and sport and recreation activities are located, designed, and	The development is being designed to minimise impacts to the environment from emissions of noise, dust, air, and odour. Greenhouse gas emissions have also been calculated and included in the

State Interest and Benchmarks	State Interest Policies	Response
<i>Community health and safety, and the natural and built environment, are protected from potential adverse impacts of emissions and hazardous activities. The operation of appropriately established industrial development, major infrastructure, and sport and recreation activities is ensured.</i>	managed to avoid or mitigate adverse impacts of emissions on sensitive land uses and the natural environment.	assessment and mitigation measures. Details of these measures and associated studies are included in Air Quality and Odour, Noise, and Climate Change and Greenhouse Gases.
	2) Activities involving the use, storage, and disposal of hazardous materials and prescribed hazardous chemicals, dangerous goods, and flammable or combustible substances are located and managed to minimise the health and safety risks to communities and individuals.	The development will both use and handle materials deemed hazardous as part of the required operations. Australian Standards relating to the handling, storage, containment, management, and disposal of these materials and substances will be integrated into the design of the facilities and implemented through Site Based Management Plan(s).
	3) Prescribed hazardous chemicals, stored in a flood hazard area (where exceeding the hazardous chemicals flood hazard threshold), are located to minimise the risk of inundation and dispersion.	Mapped Q100 flood extents have been included in the overall layout planning and design of the development to ensure that impacts from hazardous materials are mitigated in the event of a flood. This is covered in Natural Hazards and Risks.
	4) Sensitive land uses are protected from the impacts or previous activities that may cause risk to people or property, including: <ul style="list-style-type: none"> a. Formed mining activities and related hazards (e.g., disused underground mines, tunnels, and shafts) b. Former landfill and refuse sites c. Contaminated land 	Former land uses on the subject land include historical quarrying activities, which are discussed in more detail in Regional Geology and Topography. Some areas of the site have been listed on the Environmental Management Register (EMR) due to regulated activities occurring on those lots. Contaminated land assessments have been conducted and are discussed in Contaminated Land. The design of the development, which includes numerous waste management

State Interest and Benchmarks	State Interest Policies	Response
		infrastructure components, will include all necessary and reasonable measures to prevent impacts to surrounding sensitive land uses and contamination.
	<p>5) Protect the following existing and approved land uses or areas from encroachment by development that would compromise the ability of the land use to function safely and effectively:</p> <ul style="list-style-type: none"> a. Medium-impacts, high-impact, and special industries b. Extractive industries c. Hazardous chemical facilities d. Explosives facilities and explosives reserves e. High pressure gas pipelines f. Waste management facilities g. Sewage treatment plants h. Industrial land in a state development area, or an enterprise opportunity area or 	Surrounding land uses to the proposed development are discussed in Designation Area and Project Details. Measures to be made to protect the ARRC precinct from encroachment will be incorporated into the Local Planning Scheme and are discussed in more detail in Section 2.3.

State Interest and Benchmarks	State Interest Policies	Response
	<p>employment opportunity area identified in a regional plan</p> <p>i. Major sport, recreation, and entertainment facilities</p> <p>j. Shooting facilities</p> <p>k. Motor sport facilities</p>	
	<p>6) Development that is incompatible with the existing and approved land uses or areas included in policy (5) above, is located to avoid adverse impact of environmental emissions, or health and safety risks, and where the impacts cannot be practicably avoided, development is designed to minimise the impacts.</p>	<p>The development is being designed to minimise impacts to the environment from emissions of noise, dust, air, and odour. Greenhouse gas emissions have also been calculated and included in the assessment and mitigation measures. Details of these measures and associated studies are included in Air Quality and Odour, Noise, and Climate Change and Greenhouse Gases.</p>
	<p>7) Protect the natural and built environment, and human health from potential adverse impacts of acid sulfate soils by:</p> <p>a. Identifying area with high probability of containing acid sulfate soils</p> <p>b. Providing preference to land uses that will avoid, or where avoidance is not practicable, minimise the disturbance of acid sulfate soils.</p> <p>c. Including requirements for managing the disturbance of acid sulfate soils to avoid or</p>	<p>Early investigations have indicated that there is a low potential for acid sulfate soils to occur in some parts of the development area – see Regional Geology and Topography, Geology and Groundwater, and Contaminated Land. As the design progresses and the disturbance footprint for each facility is realised, targeted investigations will identify the potential for acid sulfate soils and appropriate management controls will be implemented during construction, as described in Construction Environmental Management.</p>

State Interest and Benchmarks	State Interest Policies	Response
	minimise the mobilisation and release of acid, iron, or other contaminants.	
<p>Natural Hazards, Risk, and Resilience</p> <p><i>The risks associated with natural hazards, including the protected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards.</i></p>	<p>1) Natural hazards areas are identified including:</p> <ul style="list-style-type: none"> a. Bushfire prone areas b. Flood hazard areas c. Landslide hazard areas d. Storm tide inundation areas e. Erosion prone areas 	<p>The ARRC development does not occur in a storm tide inundation area, erosion prone area, or landslide hazard area. Areas surrounding the site have been indicated as being vulnerable to flood and bushfire. Further discussion on these is provided in Natural Hazards and Risks.</p>
	<p>2) A fit-for-purpose risk assessment is undertaken to identify and achieve an acceptable or tolerable level of risk for personal safety and property in natural hazard areas.</p>	<p>An initial, desktop natural hazards risk assessment has been completed. The findings of this assessment have been discussed in Natural Hazards and Risks.</p>
	<p>3) Land in an erosion prone area is not to be used for urban purposes, unless the land is located in:</p> <ul style="list-style-type: none"> a. An urban area in a planning scheme b. An urban footprint identified in a regional plan 	<p>The development is not occurring within a mapped erosion prone area.</p>

State Interest and Benchmarks	State Interest Policies	Response
	<p>4) Development in bushfire, flood, landslide, storm tide inundation, or erosion prone natural hazard areas:</p> <ul style="list-style-type: none"> a. Avoids the natural hazard area; or b. Where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to acceptable or tolerable level. 	<p>The ARRC development does not occur in a storm tide inundation area, erosion prone area, or landslide hazard area. Areas surrounding the site have been indicated as being vulnerable to flood and bushfire. Further discussion on these is provided in Natural Hazards and Risks.</p>
	<p>5) Development in natural hazard areas:</p> <ul style="list-style-type: none"> a. Supports, and does not hinder disaster management capacity and capabilities b. Directly, indirectly, and cumulatively avoids and increase in the exposure or severity of the natural hazard and the potential for damage on the site or to other properties. c. Avoids risks to public safety and the environment from the location of the storage of hazardous materials and the release of these materials as a result of a natural hazard. 	<p>The ARRC development does not occur in a storm tide inundation area, erosion prone area, or landslide hazard area. Areas surrounding the site have been indicated as being vulnerable to flood and bushfire. Further discussion on these is provided in Natural Hazards and Risks.</p> <p>Topographical consideration, such as cut and fill, are being included in the design process to ensure that impacts from natural hazards are not worsened by changes to elevation or topography on site (Regional Geology and Topography).</p>

State Interest and Benchmarks	State Interest Policies	Response
	d. Maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard.	
	6) Community infrastructure is located and designed to maintain the required level of functionality during and immediately after a natural hazard event.	The development is located on lots that are accessible by local government-controlled roads that are maintained for access following natural hazard events. Design considerations for the development include the provision of access following natural hazards (Natural Hazards and Risks and Traffic and Transport).
	<p>7) Coastal protection work in an erosion prone area is undertaken only as a last resort where coastal erosion or inundation presents an imminent threat to public safety or existing buildings and structures, and all of the following apply:</p> <p>a. The building or structure cannot reasonably be relocated or abandoned.</p> <p>b. Any erosion control structure is located as far landward as practicable and on the lot containing the property to the maximum extent reasonable</p>	The development does not occur in an erosion prone area or include coastal protection work.

State Interest and Benchmarks	State Interest Policies	Response
	c. Any increase in coastal hazard risk for adjacent areas from the coastal protection work is mitigated.	
	<p>8) Development does not occur unless the development cannot feasibly be located elsewhere and is:</p> <ul style="list-style-type: none"> a. Coastal-dependent development; or b. Temporary, readily relocatable, or able to be abandoned development; or c. Essential community infrastructure; or d. Minor redevelopment of an existing permanent building or structure than cannot be relocated or abandoned. 	The development is considered essential community infrastructure.
	9) Development permitted in policy (8) above, mitigates the risks to people and property to an acceptable or tolerable level.	The development is being designed in a manner that considers and mitigates risks to people and property to an acceptable or tolerable level. Further discussion on this is provided in Section 3.1 .
Planning for Infrastructure		
Energy and Water Supply	1) Existing and approved future major electricity infrastructure locations and corridors (including easements and electricity	A high-level energy and water supply and demand assessment have been completed for the ARRC precinct and is provided in summary in Public Utilities. The positioning of the development does not impact any

State Interest and Benchmarks	State Interest Policies	Response
<i>The timely, safe, affordable, and reliable provision and operation of electricity and water supply infrastructure is supported, and renewable energy development is enabled.</i>	substations), and bulk water supply infrastructure locations and corridors (including easements) are protected from development that would compromise the corridor integrity, and the efficient delivery and functioning of the infrastructure.	existing or approved future major infrastructure locations related to energy or water supply. Of note is that residual WtE facility within the ARRC development will contribute power to the network once operational.
	2) Major electrical infrastructure and bulk water supply infrastructure, such as pump stations, water quality facilities, and electricity substations, are protected from encroachment by sensitive land uses where practicable.	A high-level energy and water supply and demand assessment have been completed for the ARRC precinct and is provided in summary in Public Utilities. The positioning of the development does not impact any existing or approved future major infrastructure locations related to energy or water supply. Of note is that residual WtE facility within the ARRC development will contribute power to the network once operational.
	3) Development of major electricity infrastructure and bulk water supply infrastructure avoids or otherwise minimises adverse impacts on surrounding land uses and the natural environment.	<p>While not considered development for electricity infrastructure or bulk water supply infrastructure, the ARRC precinct will supply electricity generated by the residual WtE facility to the grid, network, and/or customers. Further discussion on this is provided in Project Description and Public Utilities.</p> <p>The project is being designed to minimise impacts on surrounding land uses and the natural environment. A comprehensive environmental and social impact assessment is being completed to ensure the engineering and design has appropriate recommendations and basis for environmental protection included. This EAR, in particular Environmental</p>

State Interest and Benchmarks	State Interest Policies	Response
		Impact Assessment and Management provides a planning-specific assessment of the environment and the project's mechanisms for minimising its impact.
	4) The development and supply of renewable energy at the regional, local, and individual scale is enabled in appropriate locations.	While not considered development for electricity infrastructure, the ARRC precinct will supply electricity generated by the residual WtE facility to the grid, network, and/or customers in appropriate locations. Further discussion on this is provided in Project Description and Public Utilities.
<p>Infrastructure Integration</p> <p><i>The benefits of past and ongoing investment in infrastructure and facilities are maximised through integrated land use planning.</i></p>	1) The outcomes of significant infrastructure plans and initiatives by all levels of government are considered and reflected where relevant.	The proposal for the ARRC development has and is being reviewed and is in regular consultation with all levels of government. The ARRC development responds to numerous National and State strategic and policy positions related to the circular economy, reducing reliance on landfill, resource recovery, and net zero waste targets. Further discussion on how the project achieves these is provided in Project Description.
	2) Development achieves a high level of integration with infrastructure planning to: <ul style="list-style-type: none"> a. Promote the most efficient, effective, and flexible use of existing and planned infrastructure 	<p>An existing infrastructure and utility assessment has been conducted and the outcomes are being used to inform the development, design, and likely upgrades that will be required to the networks. This is covered in more detail in Public Utilities and Traffic and Transport.</p> <p>A comprehensive environmental and social impact assessment and an economic impact assessment are being completed to ensure the engineering and design has appropriate recommendations and basis for</p>

State Interest and Benchmarks	State Interest Policies	Response
	<ul style="list-style-type: none"> b. Realise multiple economic, social, and environmental benefits from infrastructure investment. c. Ensure consideration of future infrastructure need to support infill and greenfield growth areas. d. Optimise the location of future infrastructure within communities to provide greater access to facilities and services and enable productivity improvements. 	<p>environmental protection included. This EAR, in particular Environmental Impact Assessment and Management provides a planning-specific assessment of the environment and the project's mechanisms for minimising its impact.</p> <p>Discussion around the purpose of the ARRC development and its contribution to future infrastructure, benefits of investment in the proposed infrastructure, and the location of the proposed development are further described in Designation Area and Project Details.</p>
	<p>3) Development occurs:</p> <ul style="list-style-type: none"> a. In areas currently services by state and/or local infrastructure and associated services; or b. In a logical and orderly location, form, and sequence to enable the cost-effective delivery of state and local infrastructure to service development. 	<p>The ARRC development will be delivered in stages appropriate to the need of the infrastructure, the timing of end of life for existing City infrastructure for which the ARRC is replacing, and in consideration of the construction and finance sectors to service the needs of the development. This is discussed further in Designation Area and Project Details.</p>
	<p>4) Existing and planned infrastructure is protected from development that would compromise the ability of infrastructure and</p>	<p>Measures to be made to protect the ARRC precinct from encroachment will be incorporated into the Local Planning Scheme.</p>

State Interest and Benchmarks	State Interest Policies	Response
	associated services to operate safely and efficiently.	
Transport Infrastructure <i>The safe and efficient movement of people and goods is enabled, and land use patterns that encourage sustainable transport are supported.</i>	1) Transport infrastructure and existing and future transport corridors are reflected and supported through compatible land uses.	A Traffic Impact Assessment has been completed for the purpose of assessing the impact of the ARRC development at a high level, with further detailed assessments currently underway. A summary of this assessment has been provided in Traffic and Transport.
	2) Development is located in areas currently serviced by transport infrastructure, and where this cannot be achieved, development is facilitated in a logical and orderly locations, form, and sequence to enable cost-effective delivery of new transport infrastructure to service development.	A Traffic Impact Assessment has been completed for the purpose of assessing the impact of the ARRC development at a high level, with further detailed assessments currently underway. A summary of this assessment has been provided in Traffic and Transport.
	3) Development achieves a high level of integration with transport infrastructure and supports public passenger transport and active transport as attractive alternatives to private transport.	A Traffic Impact Assessment has been completed for the purpose of assessing the impact of the ARRC development at a high level, with further detailed assessments currently underway. A summary of this assessment has been provided in Traffic and Transport.
	4) Development is located and designed to mitigate adverse impacts on development	The development is not likely to be impacted by environmental emissions generated by nearby transport infrastructure due to the nature of the proposed operations in the development.

State Interest and Benchmarks	State Interest Policies	Response
	from environmental emissions generated by transport infrastructure.	
	5) A road hierarchy is identified that reflects the role of each category of road and effectively manages all types of traffic.	The ARRC development does not include the development of roads.
	6) Development in areas surround state transport infrastructure, and existing and future state transport corridors, is compatible with, or supports the most efficient use of, the infrastructure and transport network.	A Traffic Impact Assessment has been completed for the purpose of assessing the impact of the ARRC development at a high level, with further detailed assessments currently underway. A summary of this assessment has been provided in Traffic and Transport.
	7) The safety and efficiency of existing and future state transport infrastructure, corridors, and networks is not adversely affected by development.	A Traffic Impact Assessment has been completed for the purpose of assessing the impact of the ARRC development at a high level, with further detailed assessments currently underway. A summary of this assessment has been provided in Traffic and Transport.

State Development Assessment Provisions

State Development Assessment Provisions (SDAP) provide assessment benchmarks for development applications where the State is the assessment manager or a referral agency. The State Assessment and Referral Agency (SARA) uses SDAP to deliver a coordinated, all of Queensland Government approach to the assessment of development applications at a state level. SDAP considers matters of state significance, which include:

- 1) Development in a State-controlled Road Environment
- 2) Development in a State-controlled Railway Environment
- 3) Development in a Busway Environment
- 4) Development in a Light Rail Environment
- 5) Development in a State-controlled Transport Tunnel Environment
- 6) Protection of State Transport Networks
- 7) Maritime Safety
- 8) Coastal Development and Tidal Works
- 9) Great Barrier Reef Wetland Protection Areas
- 10) Taking or Interfering with Water
- 11) Removal, Destruction, or Damage of Marine Plants
- 12) Development in a Declared Fish Habitat Area
- 13) Unexploded Ordinance
- 14) Queensland Heritage
- 15) Removal of Quarry Material from a Lake or Watercourse
- 16) Native Vegetation Clearing
- 17) Aquaculture
- 18) Constructing or Raising Waterway Barrier Works in Fish Habitats
- 19) Category 3 Levees
- 20) Referable Dams
- 21) Hazardous Chemical Facilities
- 22) Environmentally Relevant Activities
- 23) Wind Farm Development
- 24) Urban Design Outcomes for Significant Projects
- 25) Development in South East Queensland Koala Habitat Areas
- 26) Solar Farm Development
- 27) Battery Storage Facility Development

The SDAP contains criteria for assessment within State Codes to clarify when the State is to be involved in the assessment of an application and the specific matters of State interest that apply. SDAP is a specific benchmark assessment that development must be assessed against under the Reg.

The SDAP codes that apply to the subject development have been identified as:

- Code 16 – Native Vegetation Clearing
- Code 22 – Environmentally Relevant Activities
- Code 25 – Development in South East Queensland Koala Habitat Areas.

ShapingSEQ 2023

ShapingSEQ 2023 is the 25-year strategic regional plan for South East Queensland and was given effect on 15 December 2023. It provides a regional framework for guiding and managing future growth, change, land use, and development in South East Queensland under the principles of sustainable development, setting long term planning directions for sustainable growth, economic development, and a higher standard of living. *ShapingSEQ 2023* provides strategic direction for the 12 local government areas in the region and provides structured guidance on future infrastructure planning.

ShapingSEQ 2023 sets this vision and provides the planning framework to achieve it. Chapter 1 of the plan includes goals to achieve the for *ShapingSEQ 2023*:

- **Goal 1 – Grow:** Sustainably accommodating a growing population
- **Goal 2 – Prosper:** A globally competitive economic powerhouse
- **Goal 3 – Connect:** Moving people, products, and information efficiently
- **Goal 4 – Sustain:** Promoting ecological sustainability and resilience
- **Goal 5 – Live:** Live in well-designed communities

Under the vision of 'Sustain', *ShapingSEQ 2023* notes that in 50 years:

“SEQ will have reached net zero emissions, be powered predominantly by renewable energy and be resilient to the projected effects of climate changes. SEQ will be carbon neutral and have net zero waste, and our food, water and energy supply systems will be flexible, reliable and secure.”

The ARRC development responds to the 'Sustain' vision specifically by addressing the urgent need to divert waste from landfill, seek alternative waste management processing solutions, and increase resource recovery in order to meet net zero waste targets. The ARRC also assists in contributing to the net zero emissions goal by diverting waste from landfill, therefore reducing the magnitude of harmful methane greenhouse gas emissions. By processing residual waste via waste to energy technologies, the ARRC development will also be contributing to the diversion of energy source from non-renewable fossil fuels to renewable sources – in the case of the ARRC, solid waste.

Further building upon the vision statements, Chapter 2 of *ShapingSEQ 2023* sets out the following 10 regional priorities:

1. A sustainable growth pattern
2. More homes, faster supply, diversity, and affordability
3. More social and affordable homes
4. Well-designed communities

-
5. Integrating land use and infrastructure
 6. New economic opportunities and jobs
 7. A sufficient pipeline of industrial land
 8. Incorporating Aboriginal and Torres Strait Islander knowledge, culture traditions, and aspirations
 9. Regional approach to natural hazards
 10. Better biodiversity outcomes for growth areas.

Under the regional priority 'a sufficient pipeline of industrial land', the plan states:

"Supply of sufficient industrial land across SEQ is a key priority to service the growing population and to ensure SEQ can make the most of the opportunities presented by innovations in sectors such as manufacturing, waste and energy".

The priority goes on further to state:

"One key priority for industrial land in SEQ is to support the resource recovery and recycling task set under the Queensland Waste Management and Resource Recovery Strategy (2019). MEIAs are ideal locations to accommodate the network of Recycling Enterprise Precincts (REPs) that will provide opportunities for sustainable economic development based on the use and reuse of materials."

The Yatala – Stapylton – Beenleigh MEIA has been identified as a location suitable for an REP, and Stapylton specifically is seeing growth targeted towards waste management and resource recovery industries and manufacturing. The ARRC development is to be located in Stapylton and is therefore consistent with the intent of the REP, the MEIA, and *ShapingSEQ 2023*.

Chapter 3 of *ShapingSEQ 2023* sets out Part A: Outcomes and strategies, Part B: The regional growth pattern, and Part C: Sub regional directions. Part A aligns with the goals discussed in Chapter 1 and sets outcomes and strategies for achieving each goal. Under Goal 2: Prosper, a number of priority actions have been set out that are relevant to the ARRC development:

- Priority Action 3 – Strengthening Regional Economic Clusters (RECs): Table 4 in the plan sets out the identified regional economic clusters and identifies the core components. The Yatala – Stapylton – Beenleigh regional economic cluster notes the inclusion of a Major Enterprise and Industrial Area. The ARRC development is occurring within this MEIA and is of an industrial nature consistent with the *ShapingSEQ 2023* regional industrial land framework, where waste and the circular economy are noted specifically as relevant and appropriate.
- Priority Action 4 – Establish a regional industrial land framework: Includes industrial land for Recycling Enterprise Precincts. One of the key aspects in this priority action is the preparation of precincts to *"consolidate locations for waste that can be recycled or transformed"* and includes the provision of *"large-scale locations where waste is recycled or transformed."* Stapylton has been identified as a location for a REP and the ARRC development is to be located in Stapylton. As such, the ARRC precinct is considered appropriate and consistent with Priority Action 4.

Part C discusses sub-regional directions under the category of each goal within each sub-region. The ARRC precinct will be located in the southern sub-region described in the plan, and the following outcomes have been identified as relevant to the goals:

- Prosper – RECs: The ARRC will be located in the Yatala – Stapylton – Beenleigh REC, which represents a significant manufacturing cluster with a specialisation in priority sectors. The ARRC precinct includes several process precincts that will separate recyclable materials and enable small enterprises to conduct research and development of materials produced from the ARRC in the creation of materials that can be used to manufacture new products, enhancing the circular economy and enabling growth in the manufacturing sector.
- Prosper – Industrial land: The intent to deliver a sufficient supply of suitable land for industrial development that considers anticipated demand, constraints of the land, surrounding land uses and proximity to essential infrastructure required to service industrial development will be achieved in the Urban Footprint expansion area at Stapylton as a short-medium-term supply of industrial land in the subregion. Because of its location and scale, the expansion of the Yatala / Stapylton MEIA represents the most appropriate policy response to the regional industrial land challenges within the Gold Coast context. In addition, a potential future growth area is also identified over a broader area at Stapylton as an area that may be suitable for future industrial land uses.

2.2.5 Local Government Planning Instruments and Other Strategies

While designations are not subject to assessment under local government planning instruments, they should have regard to them and their requirements. Section 8 of the Act identifies a local planning instrument as:

- A planning scheme
- A temporary local planning instrument
- A planning scheme policy

The City communicates its Planning Scheme via an interactive, online spatial tool that is supported by numerous codes and standards. Version 11 (effective 6 February 2024) is the current version of the Gold Coast City Plan (City Plan) and is the local government planning scheme and instrument relevant to the subject land.

Gold Coast City Plan

The details for the City Plan provisions and requirements for each lot subject to this LGID are provided in the tables and figures below.

Table 5 City Plan Property Report 36SP222486

Planning Scheme Information	
Applicable Planning Scheme	Gold Coast City Plan, version 11
Lot on Plan	36 on SP222486
Property Address	Lot 36 Christensen Road, Stapylton, 4207
Division	Division 1

Zone	Special Purpose
Overlays	<ul style="list-style-type: none"> • Acid sulfate soils (land at or below 5m AHD) • Acid sulfate soils (land at or below 20m AHD) • Airport environs – procedures for Air Navigation Services, Aircraft Operational (PANS-OPS) surfaces (PANS-OPS contour) • Bushfire hazard area (very high potential bushfire intensity) • Bushfire hazard area (high potential bushfire intensity) • Bushfire hazard area (medium potential bushfire intensity) • Bushfire hazard area (potential impact buffer) • Environmental significance – priority species, MSES (State-significant species) • Environmental significance – priority species, MSES (Koala habitat areas) • Environmental significance – priority species, MLES (local significant species) • Environmental significance – vegetation management, MSES (regulated vegetation) • Environmental significance – vegetation management, MLES (vegetation management) • Environmental significance – wetlands and waterways (MSES – wetlands and waterways) • Environmental significance – wetlands and waterways (MLES – wetlands and waterways, locally significant wetlands) • Environmental significance – wetlands and waterways (MLES watercourse 30m buffer; wetlands 100m buffer area) • Extractive resources separation area • Flood – flood assessment required • Industry, community infrastructure and agriculture land interface area (future Stapylton sewage treatment plant; agriculture land interface area) • Water catchments and dual supply system area (Woongoolba flood mitigation catchment area)
LGIP	<ul style="list-style-type: none"> • Priority infrastructure area • Plan for trunk transport infrastructure – transport service catchment • Plan for trunk water infrastructure – future water supply service catchments

	<ul style="list-style-type: none"> Plan for trunk sewerage infrastructure – future sewerage service catchments Plan for trunk sewerage infrastructure – collection and treatment (future trunk sewerage treatment plants 2066; future trunk sewerage gravity mains 2026) Plan for trunk sewerage infrastructure Plan for trunk stormwater infrastructure – stormwater service catchments Plan for trunk public parks and land for community facilities infrastructure (sport park service catchment; community facility service catchment, recreation park service catchments)
Intended Land Use (ARRC)	<ul style="list-style-type: none"> Ancillary works area (administration, laydown, etc.) related to the solid waste management precinct

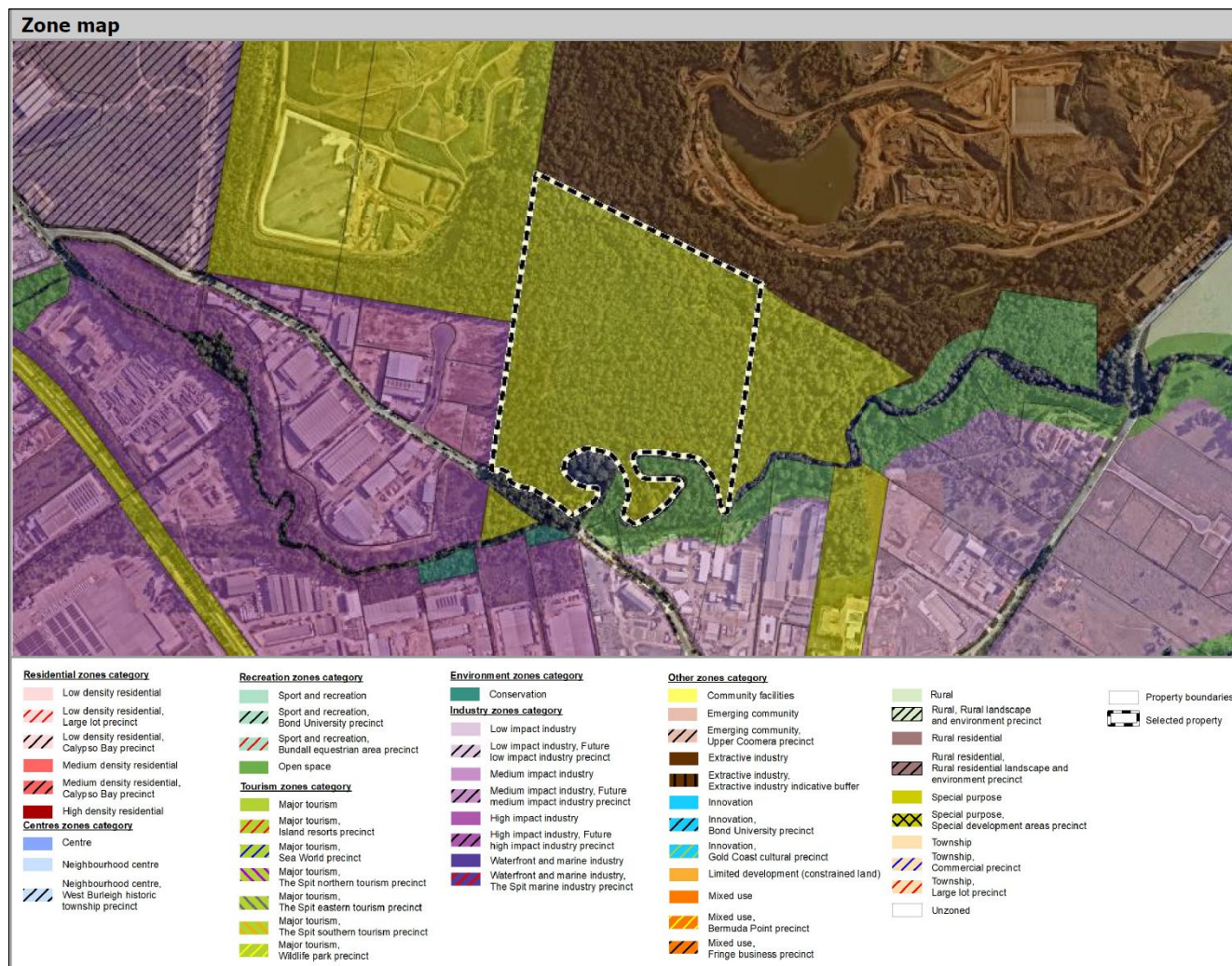


Figure 3 City Plan Zone Map 36SP222486

Table 6 City Plan Property Report 12SP109916

Planning Scheme Information	
Applicable Planning Scheme	Gold Coast City Plan, version 11
Lot on Plan	12 on SP109916
Property Address	Lot 12 Rossmanns Road, Stapylton, 4207
Division	Division 1
Zone	Special Purpose
Overlays	<ul style="list-style-type: none"> • Acid sulfate soils (land at or below 5m AHD) • Acid sulfate soils (land at or below 20m AHD) • Airport environs – procedures for Air Navigation Services, Aircraft Operational (PANS-OPS) surfaces (PANS-OPS contour) • Bushfire hazard area (high potential bushfire intensity) • Bushfire hazard area (medium potential bushfire intensity) • Bushfire hazard area (potential impact buffer) • Environmental significance – priority species, MSES (State-significant species) • Environmental significance – priority species, MSES (Koala habitat areas) • Environmental significance – priority species, MLES (local significant species) • Environmental significance – vegetation management, MSES (regulated vegetation) • Environmental significance – vegetation management, MLES (vegetation management) • Environmental significance – wetlands and waterways (MSES – wetlands and waterways) • Environmental significance – wetlands and waterways (MLES – wetlands and waterways, locally significant wetlands) • Environmental significance – wetlands and waterways (MLES watercourse 30m buffer; wetlands 100m buffer area) • Extractive resources separation area • Flood – flood assessment required • Industry, community infrastructure and agriculture land interface area

	<ul style="list-style-type: none"> Regional infrastructure – major electricity infrastructure (Energex) Water catchments and dual supply system area (Woongoolba flood mitigation catchment area)
LGIP	<ul style="list-style-type: none"> Priority infrastructure area Plan for trunk transport infrastructure – transport service catchment Plan for trunk water infrastructure – future water supply service catchments Plan for trunk sewerage infrastructure – future sewerage service catchments Plan for trunk stormwater infrastructure – stormwater service catchments Plan for trunk public parks and land for community facilities infrastructure (sport park service catchment; community facility service catchment, recreation park service catchments)
Intended Land Use (ARRC)	<ul style="list-style-type: none"> Ancillary works area (administration, laydown, etc.) related to the solid waste management precinct

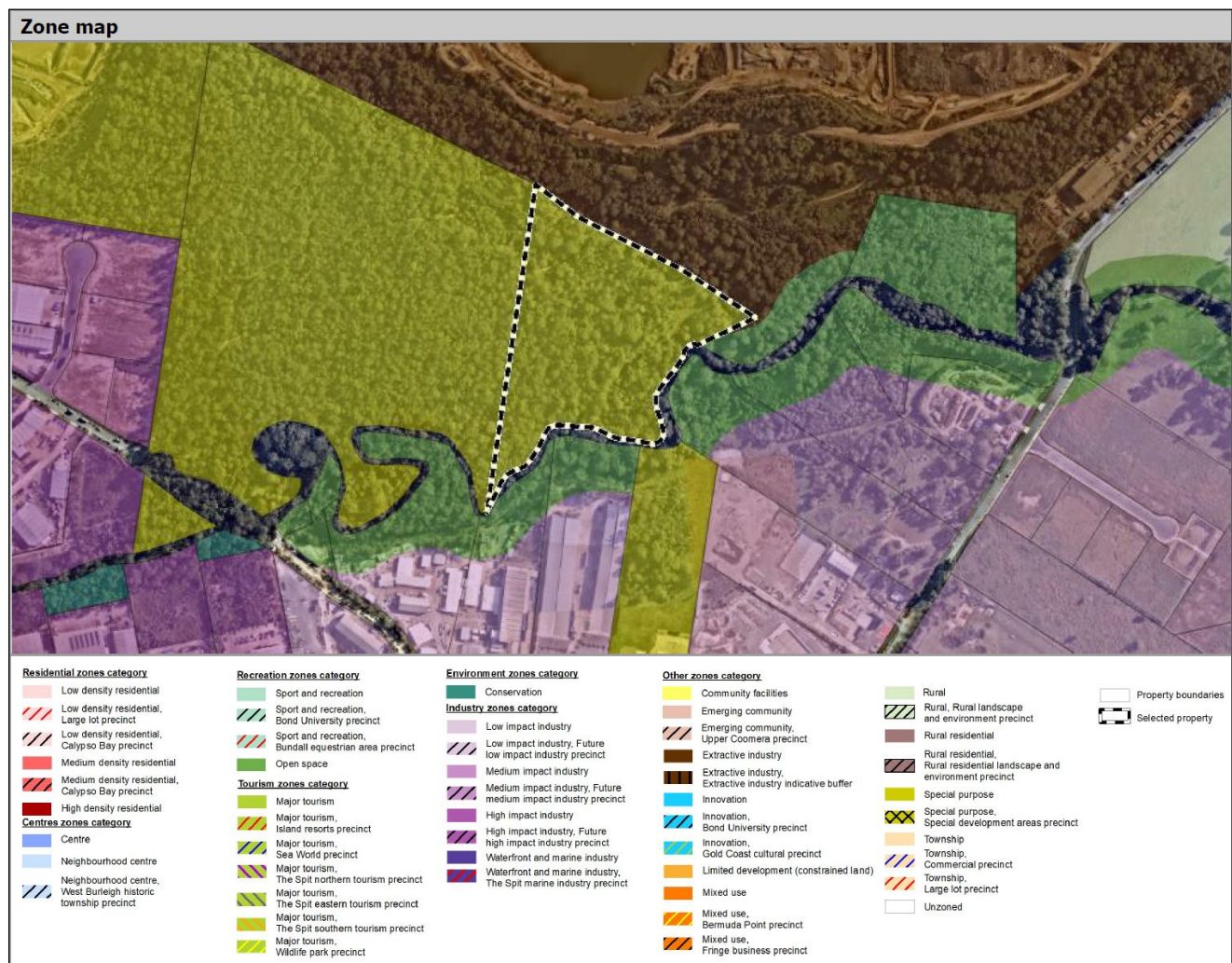


Figure 4 City Plan Zone Map 12SP109916

Table 7 City Plan Property Report 2SP171268

Planning Scheme Information	
Applicable Planning Scheme	Gold Coast City Plan, version 11
Lot on Plan	2 on SP171268
Property Address	Lot 2 Rossmanns Road, Stapylton, 4207
Division	Division 1
Zone	Extractive Industry
Overlays	<ul style="list-style-type: none"> • Acid sulfate soils (land at or below 20m AHD) • Airport environs – procedures for Air Navigation Services, Aircraft Operational (PANS-OPS) surfaces (PANS-OPS contour) • Bushfire hazard area (high potential bushfire intensity) • Bushfire hazard area (medium potential bushfire intensity) • Bushfire hazard area (potential impact buffer) • Environmental significance – priority species, MSES (Koala habitat areas) • Environmental significance – priority species, MLES (local significant species) • Environmental significance – vegetation management, MLES (vegetation management) • Environmental significance – wetlands and waterways (buffer area) • Environmental significance – wetlands and waterways (MLES watercourse 30m buffer area) • Extractive resources separation area • Extractive resources – 100m transport route separation area • Industry, community infrastructure and agriculture land interface area • Industry, community infrastructure and agriculture land interface area – community infrastructure interface area (waste and recycling centre) • Landslide hazard • Water catchments and dual supply system area (Woongoolba flood mitigation catchment area)

LGIP	<ul style="list-style-type: none"> • Priority infrastructure area • Plan for trunk transport infrastructure – transport service catchment • Plan for trunk water infrastructure – future water supply service catchments (future trunk water mains 2026) • Plan for trunk sewerage infrastructure – future sewerage service catchments • Plan for trunk stormwater infrastructure – stormwater service catchments • Plan for trunk public parks and land for community facilities infrastructure (recreation park service catchments)
Intended Land Use (ARRC)	<ul style="list-style-type: none"> • Southern mono cell and Community Education Centre



Figure 5 City Plan Zone Map 2SP171268

Table 8 City Plan Property Report 1SP171268

Planning Scheme Information	
Applicable Planning Scheme	Gold Coast City Plan, version 11
Lot on Plan	1 on SP171268
Property Address	Lot 1 Rossmanns Road, Stapylton, 4207
Division	Division 1
Zone	Special Purpose
Overlays	<ul style="list-style-type: none"> • Acid sulfate soils (land at or below 5m AHD) • Acid sulfate soils (land at or below 20m AHD) • Airport environs – procedures for Air Navigation Services, Aircraft Operational (PANS-OPS) surfaces (PANS-OPS contour) • Bushfire hazard area (high potential bushfire intensity) • Bushfire hazard area (medium potential bushfire intensity) • Bushfire hazard area (potential impact buffer) • Environmental significance – priority species, MSES (Koala habitat areas) • Environmental significance – priority species, MLES (local significant species) • Environmental significance – vegetation management, MSES (regulated vegetation) • Environmental significance – vegetation management, MLES (vegetation management) • Environmental significance – wetlands and waterways (MLES waterways) • Environmental significance – wetlands and waterways (buffer area) • Environmental significance – wetlands and waterways (MLES watercourse 30m buffer area) • Extractive resources separation area • Extractive resources – 100m transport route separation area • Industry, community infrastructure and agriculture land interface area • Industry, community infrastructure and agriculture land interface area – community infrastructure interface area • Landslide hazard

	<ul style="list-style-type: none"> Water catchments and dual supply system area (Woongoolba flood mitigation catchment area)
LGIP	<ul style="list-style-type: none"> Priority infrastructure area Plan for trunk transport infrastructure – transport service catchment Plan for trunk water infrastructure – future water supply service catchments Plan for trunk sewerage infrastructure – future sewerage service catchments Plan for trunk stormwater infrastructure – stormwater service catchments Plan for trunk public parks and land for community facilities infrastructure (recreation park service catchments)
Intended Land Use (ARRC)	<ul style="list-style-type: none"> Northern mono cell and residual WtE facility

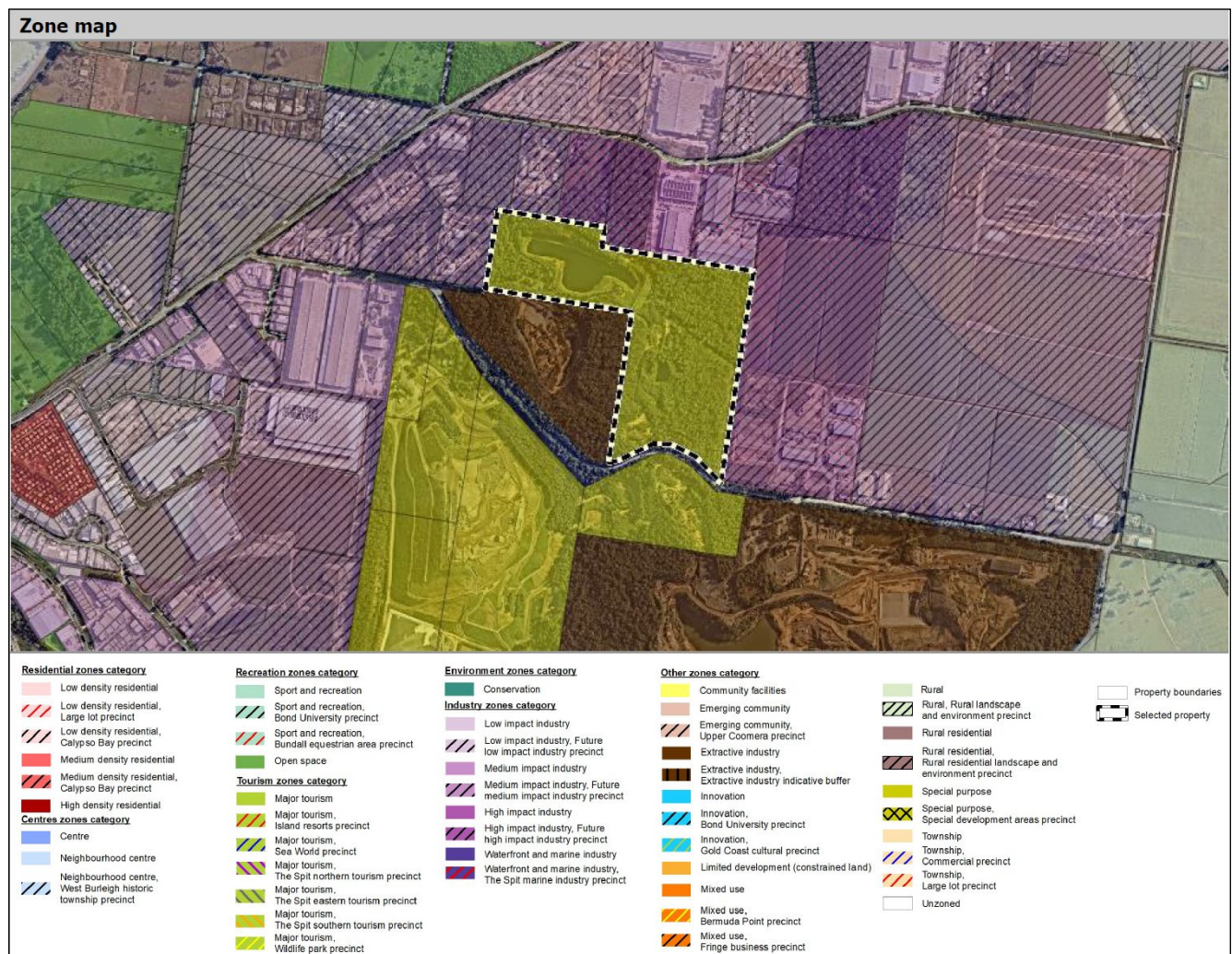


Figure 6 City Plan Zone Map 1SP171268

Table 9 City Plan Property Report 4RP110743

Planning Scheme Information	
Applicable Planning Scheme	Gold Coast City Plan, version 11
Lot on Plan	4 on RP110743
Property Address	8 Quinns Hill Road East, Stapylton, 4207
Division	Division 1
Zone	Medium Impact Industry – future medium impact industry precinct
Overlays	<ul style="list-style-type: none"> • Acid sulfate soils (land at or below 20m AHD) • Airport environs – procedures for Air Navigation Services, Aircraft Operational (PANS-OPS) surfaces (PANS-OPS contour) • Bushfire hazard area (high potential bushfire intensity) • Bushfire hazard area (potential impact buffer) • Environmental significance – vegetation management, MLES (vegetation management) • Environmental significance – wetlands and waterways (MLES wetlands and waterways, minor waterway) • Environmental significance – wetlands and waterways (buffer area) • Environmental significance – wetlands and waterways (MLES watercourse 30m buffer area) • Extractive resources separation area • Industry, community infrastructure and agriculture land interface area – community infrastructure interface area • State controlled roads, rail corridor and transport noise corridors – transport noise corridor (State-controlled road)
LGIP	<ul style="list-style-type: none"> • Priority infrastructure area • Plan for trunk transport infrastructure – transport service catchment • Plan for trunk water infrastructure – future water supply service catchments (future trunk water mains 2026) • Plan for trunk sewerage infrastructure – future sewerage service catchments • Plan for trunk stormwater infrastructure – stormwater service catchments • Plan for trunk public parks and land for community facilities infrastructure (sport park service catchments; community

	facility service catchments; recreation park service catchments)
Intended Land Use (ARRC)	<ul style="list-style-type: none"> Innovation Park



Figure 7 City Plan Zone Map 4RP110743

Table 10 City Plan Property Report 5RP110743

Planning Scheme Information	
Applicable Planning Scheme	Gold Coast City Plan, version 11
Lot on Plan	5 on RP110743
Property Address	24 Quinns Hill Road East, Stapylton, 4207
Division	Division 1

Zone	Medium Impact Industry – future medium impact industry precinct
Overlays	<ul style="list-style-type: none"> • Airport environs – procedures for Air Navigation Services, Aircraft Operational (PANS-OPS) surfaces (PANS-OPS contour) • Bushfire hazard area (potential impact buffer) • Environmental significance – priority species, MSES (Koala habitat areas) • Environmental significance – vegetation management, MLES (vegetation management) • Environmental significance – wetlands and waterways (MLES minor waterway) • Environmental significance – wetlands and waterways (buffer area) • Environmental significance – wetlands and waterways (MLES watercourse 30m; wetland 100m buffer area) • Extractive resources separation area • Industry, community infrastructure and agriculture land interface area • Landslide hazard • Water catchments and dual supply system area (Woongoolba flood mitigation catchment area)
LGIP	<ul style="list-style-type: none"> • Priority infrastructure area • Plan for trunk transport infrastructure – transport service catchment • Plan for trunk water infrastructure – future water supply service catchments • Plan for trunk sewerage infrastructure – future sewerage service catchments • Plan for trunk stormwater infrastructure – stormwater service catchments • Plan for trunk public parks and land for community facilities infrastructure (sports park, community facility, and recreation park service catchments)
Intended Land Use (ARRC)	<ul style="list-style-type: none"> • Innovation Park



Figure 8 City Plan Zone Map 5RP110743

Table 11 City Plan Property Report 6RP110743

Planning Scheme Information	
Applicable Planning Scheme	Gold Coast City Plan, version 11
Lot on Plan	6 on RP110743
Property Address	42 Quinns Hill Road East, Stapylton, 4207
Division	Division 1
Zone	High Impact Industry – high impact industry precinct
Overlays	<ul style="list-style-type: none"> Acid sulfate soils (land at or below 20m AHD) Airport environs – procedures for Air Navigation Services, Aircraft Operational (PANS-OPS) surfaces (PANS-OPS contour)

	<ul style="list-style-type: none"> • Bushfire hazard area (high potential bushfire intensity) • Bushfire hazard area (potential impact buffer) • Environmental significance – priority species, MSES (Koala habitat areas) • Environmental significance – vegetation management, MLES (vegetation management) • Environmental significance – wetlands and waterways (MLES waterway – minor) • Environmental significance – wetlands and waterways (buffer area) • Environmental significance – wetlands and waterways (MLES watercourse 30m buffer area; wetland 100m buffer area) • Industry, community infrastructure and agriculture land interface area – community infrastructure interface area • Landslide hazard • Water catchments and dual supply system area (Woongoolba flood mitigation catchment area)
LGIP	<ul style="list-style-type: none"> • Priority infrastructure area • Plan for trunk transport infrastructure – transport service catchment • Plan for trunk water infrastructure – future water supply service catchments • Plan for trunk sewerage infrastructure – future sewerage service catchments • Plan for trunk stormwater infrastructure – stormwater service catchments • Plan for trunk public parks and land for community facilities infrastructure (sport park, community facility, and recreation park service catchments)
Intended Land Use (ARRC)	<ul style="list-style-type: none"> • Material Recovery Facility

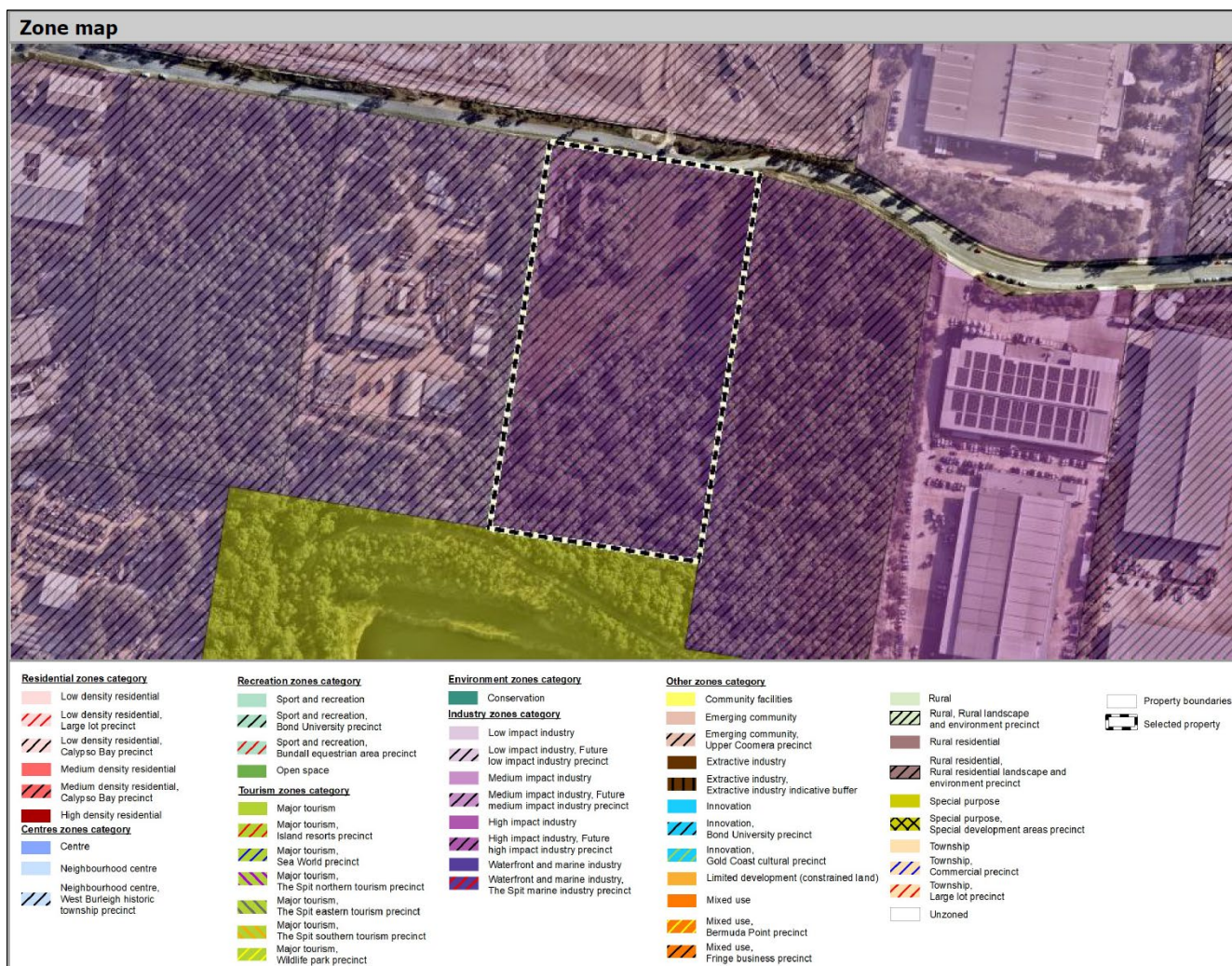


Figure 9 City Plan Zone Map 6RP110743

New Planning Scheme Development

The City is currently in the process of preparing a new Planning Scheme and Local Growth Management Strategy (LGMS) to guide the planning and delivery of growth over the next 20 years. The Planning Scheme and LGMS incorporates planning for:

- 388,300 more residents
- 185,000 new dwellings
- 173,800 more jobs

The new planning scheme aligns with the SPP and responds specifically to the updated *ShapingSEQ 2023* plan and addresses the following considerations:

- Population growth and density: the right mix of housing choice and diversity, housing supply and affordability
- Infrastructure: new and upgraded water, sewer, stormwater, roads and open space
- Employment: growth in appropriate locations, scale and mix of uses, individual and household salary profile, diverse and affordable housing
- Lifestyle and community: continue to enhance the Gold Coast way of life
- Resilience and natural environment: evolve a city built on a coastal plain and boarded by mountain ranges and plan for future flooding, bushfire, landslide and coastal hazards while continuing to protect and enhance our natural environment

The LGMS aims to provide an overarching strategic direction for the new planning scheme. The LGMS considers:

- Where people and their families will live during their lifetime and types of housing needed
- What types of jobs there will be and where
- How people will commute easily to work or access services
- Response to technology, environmental protection, natural hazards and infrastructure

Any proposed LGIDs that are made will need to be incorporated into the planning scheme as appropriate.

Where feasible and appropriate, known proposed LGIDs are being accommodated where land use is consistent with the planning scheme changes. The ARRC is consistent with the proposed new planning scheme and therefore is being considered as part of the ongoing consultation and development.

City Plan Designation and the LGID Impact

Table 12 provides the current City Plan zoning for each of the properties proposed to be included in the LGID along with the proposed re-zoning and justification.

Table 12 Current City Plan zoning of the premises proposed for LGID and proposed changes

Lot on Plan / Property Address	Current Zoning	Proposed Zoning
36SP222486 (Lot 36 Christensen Road, Stapylton 4207)	Special Purpose	Special Purpose (no change) – proposed land use (waste management) is listed in Schedule 5 of the Planning Reg and consistent with the Special Purpose zone code
12SP109916 Lot 12 Rossmanns Road, Stapylton 4207	Special Purpose	Special Purpose (no change) – proposed land use (waste management) is listed in Schedule 5 of the Planning Reg and consistent with the Special Purpose zone code
2SP171268 Lot 2 Rossmanns Road, Stapylton 4207	Extractive Industry	Special Purpose – site is a former quarry that is no longer in active operations, therefore no longer extractive industry. Proposed land use (waste management) is listed in Schedule 5 of the Planning Reg and consistent with the Special Purpose zone code
1SP171268 Lot 1 Rossmanns Road, Stapylton 4207	Special Purpose	Special Purpose (no change) – proposed land use (waste management) is listed in Schedule 5 of the Planning Reg and consistent with the Special Purpose zone code
4RP110743 8 Quinns Hill Road East, Stapylton 4207	Medium Impact Industry	Special Purpose – site is currently vegetated and mostly undeveloped. Proposed land use (waste management) is listed in Schedule 5 of the Planning Reg and consistent with the Special Purpose zone code
5RP110743 24 Quinns Hill Road East, Stapylton 4207	Medium Impact Industry	Special Purpose – site is currently utilised for mixed medium impact industry activities that will cease within 18 months to allow for development of the ARRC. Proposed land use (waste management) is listed in Schedule 5 of the Planning Reg and consistent with the Special Purpose zone code
6RP110743 42 Quinns Hill Road East, Stapylton 4207	High Impact Industry	Special Purpose – property was previously residential but within the Stapylton industry zone. Proposed land use (waste management) is listed in

Lot on Plan / Property Address	Current Zoning	Proposed Zoning
		Schedule 5 of the Planning Reg and consistent with the Special Purpose zone code

All lots included in the ARRC LGID are proposed to be zoned under the category 'Special Purpose'. The City Plan defines the Special Purpose zone code as being relevant for land designated as Community Infrastructure in Schedule 5 of the Planning Reg, including public utility. Public utility includes waste management infrastructure. The purpose of the special purpose zone code is to provide for public uses that are owned or operated by a government, statutory authority, government owned corporation, local government or private organisation in the course of a public utility undertaking, such as a defence establishment, airport, sea port, rail line, railway station, or the provision of water supply, sewerage, electricity, gas, telecommunications, transport, drainage or other like services. Furthermore, development is buffered from encroachment by incompatible uses.

Following Ministerial endorsement of the LGID, appropriate policy settings and assessment benchmarks will be required to be included in the Planning Scheme to support the strategic role and function of the ARRC. Consultation and collaboration within the City is ongoing to ensure the timely integration of the LGID into the planning scheme.

City of Gold Coast Towards Zero Waste 2025 – 2028 Plan

The City has developed a Towards Zero Waste 2025 – 2028 Plan (Zero Waste Plan) that seeks to accommodate growth on the Gold Coast through minimising waste entering the City's landfills and improve recycling and resource recovery. The Zero Waste Plan is further driven by the State Government's requirement for local governments to develop and implement waste reduction and recycling plans under the *Waste Reduction and Recycling Act 2011*.

The purpose of the Zero Waste Plan is to *"empower the Gold Coast towards a zero waste future"* by:

1. *We work together to reduce waste – our community is aware of how to reduce waste and increase recycling*
2. *Our services improve resource recovery – we have the right services to support a greener Gold Coast*
3. *Our infrastructure is future focused – sites and facilities are built to manage waste, increase recycling and reduce carbon emissions*
4. *We're invested in change – our partnerships, planning and business attraction support a circular economy and sustainable future.*

The Zero Waste Plan identifies key issues related to waste management impacting the Gold Coast, which include:

- **1 million people** – are expected to live on the Gold Coast by 2046 (an average increase of 17,659 per year). With waste management costs increasing and the Waste Disposal Levy resulting in significantly higher costs of landfilling, it is important that the City ensures services are value-for-money in the longer term.

- **10 to 15 years** – is the current remaining lifespan of the City’s landfills. Studies have revealed there are no suitable locations left for new landfills on the Gold Coast and transporting the city’s waste to landfills outside of the LGA is an expensive and unsustainable alternative.
- **302,542 tCO₂e emissions** – Landfill fugitive emissions are the largest contributor (49 per cent) to the City’s operational greenhouse gas emissions. To ensure we help protect the Gold Coast’s natural beauty and prepare for the climate-related financial disclosure, the City is focussing on reducing greenhouse gas emissions.
- **65 per cent going to landfill** – of which a significant portion could be recycled instead of being sent to landfill via household general waste bins. Household waste behaviours have not changed significantly over the past 10 years, despite education programs and expanded out-of-home recycling opportunities.
- **52 per cent medium or high-density housing** – With medium or high-density dwellings becoming more common on the Gold Coast than standalone houses, the way the City provides waste services needs to change. Providing safe services that do not add to city congestion is a priority.
- **11 different sites** – for waste and recycling are provided across the Gold Coast where customers can dispose of their waste and recycling. These provide different levels of service and convenience for customers. The City will ensure that the network is designed to help reduce waste to landfill across the Gold Coast.

The Zero Waste Plan outlines goals and targets to be achieved around improving recycling and landfill diversion over the next three years, and aligns with the City’s long-term planning, presented illustratively in Figure 10, in order to provide a sustainable future for the Gold Coast.

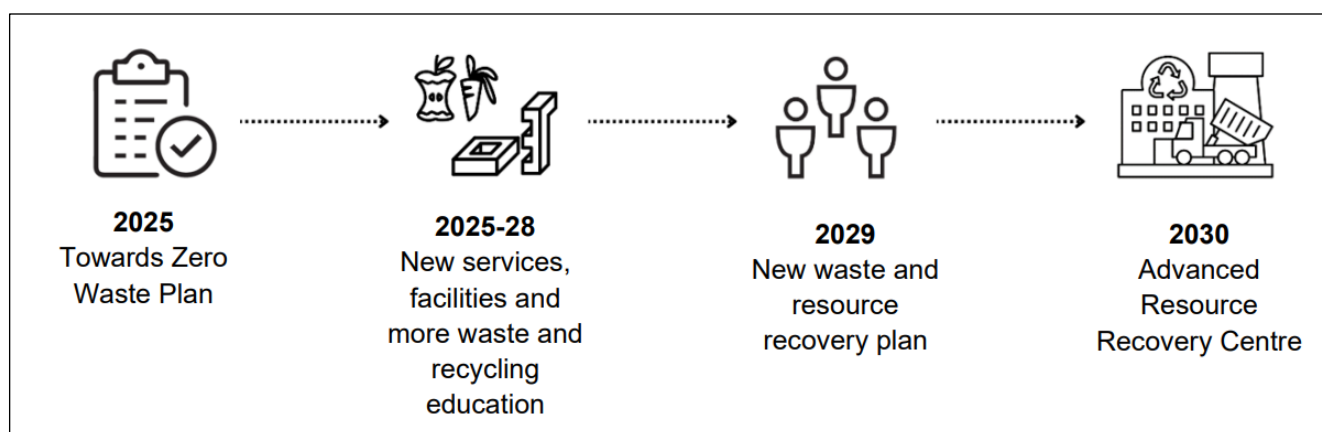


Figure 10 Long-term waste infrastructure and service planning on the Gold Coast

The ARRC presents key infrastructure to enable the realisation of the Zero Waste Plan and the long-term planning for waste reduction and sustainability on the Gold Coast. More information on the components of the precinct and their role in diverting waste from landfill, increasing recycling, improving community education, and enhancing innovation within the circular economy is presented in Section 3.1

2.3 Designation Process and Effect

2.3.1 City of Gold Coast LGID Process

The City's LGID process follows the requirements of the Minister's Guidelines and sets out steps to be followed as summarised below:

- Undertake pre-lodgement/early discussions with Department of State Development, Infrastructure and Planning (DSDIP) and City Planning (Planning Scheme/City Plan) team.
Outcome: Advice integrated into EAR.
- Prepare LGID EAR and Stakeholder Engagement Plan that align with the requirements specified in the Minister's Guidelines.
Outcome: EAR is prepared with necessary supporting technical studies and assessments.
- Infrastructure/Asset owner prepares a council agenda item notifying the need for an LGID. Stakeholder engagement strategy to be prepared at this time.
Outcome: Council resolution supporting the need to propose an LGID.
- Consultation with stakeholders commences in accordance with the Stakeholder Engagement Plan. Notification to adjoining property owners notifying them of the intent to submit an LGID for the premises to be sent in line with the consultation strategy. Public notification period commences. Public notification to be completed in accordance with the requirements of the Guidelines and the Stakeholder Engagement Plan.
Outcome: Compliant stakeholder engagement and public notification commences and is completed.
- Concurrently with stakeholder consultation and public notification, LGID EAR is submitted to DSDIP via the Infrastructure Designations Portal. Referral to relevant State departments and agencies commences via DSDIP planning officer. DSDIP collates feedback and comments from State departments and agencies.
Outcome: A request for information (RFI) is received from DSDIP to the City with any items requiring further clarification (if any).
- LGID EAR is updated and a response to the RFIs prepare and returned to DSDIP for final assessment. Letter of Endorsement from the Planning Minister is received along with any relevant conditions of endorsement from State departments and agencies.
Outcome: State LGID review and endorsement complete and received.
- Entity prepares and submits a recommendation to Council to make (or not make) the LGID.
Outcome: Relevant Council Standing Committee considers recommendation and acts accordingly.
- When approved, the Entity publishes a Gazette notice notifying of the LGID, in accordance with the Act.
Outcome: Gazette notice made and provided to State Government in accordance with the Act. Gazette notice and relevant supporting documentation provided to City Planning for inclusion in the City Plan.

Consultation

Public consultation and notification are required to be undertaken as a part of the LGID process, as directed by Chapter 8 of the Minister's Guidelines. Consultation, as well as stakeholder engagement, is set out in Section 5.

2.3.2 Impact on Planning Instruments and Approvals

The development on premises under an MID or LGID is considered “accepted development” (Section 44(6) of the Act) and therefore conditions and exceptions considered “accepted development” apply. These include:

- Operational Work
- Plumbing and drainage work
- Making a material change of use of premises
- Reconfiguring a lot

It does not include “Building Work” since this is assessable under the *Building Act 1975*. Additional approvals not considered under the four development types listed above may still be required and therefore all development must be properly assessed by the entity to identify any applicable approval requirements.

2.3.3 Other development on Designated Premises

The approval of an MID or LGID does not prevent the development of other types of infrastructure authorised under the designation; however, any development not consistent with the prescribed purpose related specifically to the designation will be subject to assessment and, if applicable, development approval.

2.3.4 Tenure and Extensions

An LGID has effect for a period of six years from the date of approval. Extensions can be sought by a public sector entity (Council) where they are the owner of the premises. Extension requests must be made in writing to the State Government (Chief Executive) a minimum of one calendar month prior to expiry.

3. Designation Area and Project Details

3.1 Introduction and Purpose

The purpose of this report is to detail the need for the premises detailed in Table 13 to be designated under an LGID for the development of an ARRC to service the Gold Coast's waste management and recycling needs.

Table 13 Subject Premises

Lot on Plan	Address	Landowner	City Plan Designation	Current Land Use
36 SP222486	Lot 36 Christensen Road, Stapylton 4207	City of Gold Coast	Special Purpose	Undeveloped, vegetated
12 SP109916	Lot 12 Rossmanns Road, Stapylton 4207	City of Gold Coast	Special Purpose	Undeveloped, vegetated
2 SP171268	Lot 2 Rossmanns Road, Stapylton 4207	City of Gold Coast	Extractive Industry	Decommissioned quarry
1 SP171268	Lot 1 Rossmanns Road, Stapylton 4207	City of Gold Coast	Special Purpose	Decommissioned quarry; recycled water infrastructure
4 RP110743	8 Quinns Hill Road East, Stapylton 4207	City of Gold Coast	Medium Impact Industry	Undeveloped, vegetated
5 RP110743	24 Quinns Hill Road East, Stapylton 4207	City of Gold Coast	Medium Impact Industry	Private drilling business and transport operation associated with prior land ownership
6 RP110743	42 Quinns Hill Road East, Stapylton 4207	City of Gold Coast	High Impact Industry	Vacant (partly cleared, partly vegetated)

3.1.1 Project Description and Need

The City collects and manages the city's solid waste via two operational landfills. With the city's population expected to exceed one million by 2041, the City has undergone significant assessment of the existing infrastructure capacity and land availability. The City's two operational landfills – Stapylton and Reedy Creek – are projected to reach capacity in the mid-2030s as a result of the rapid population growth in the region. An assessment of land availability conducted in 2022 noted that there was no suitable land available in the city for either landfill expansion or a new landfill. Furthermore, it is not in the City's interest to continue managing waste

through landfill, and instead seeks innovative, globally relevant, sustainable, and lower carbon methods for municipal waste management.

The ARRC seeks to provide socially acceptable, and environmentally and financially sustainable resource recovery and residual waste solutions that remove the city's reliance on landfill and maximises the circular economy outcomes for the City. The City aims to deliver and operate a best practice resource recovery precinct which meets the long-term needs of the City and community, and aligns with social, environmental, and regulatory requirements in a financially responsible manner. The City's key objectives include:

- **Social licence to operate:** minimise waste disposal costs, demonstrate safe, thoughtful, and sustainable operation, providing long term opportunities for local businesses and the community.
- **Value for money:** Draw on Australian and international expertise to design, deliver, and operate the ARRC precinct through the application of value management, innovation, and sustainable construction and operation practices.
- **Environmental protection:** Reduce the City's carbon footprint from managing waste, achieve international best practice on plant operational performance, and achieve and Infrastructure Sustainability Rating for the facility.
- **Future-proof the city:** Implement a solution which adapts to the future needs of the city, including changing waste volumes and characteristics with a safe, sustainable, and smart solution.

The ARRC precinct comprises eight specially designed facilities that deliver an integrated circular economy precinct. Through the precinct, the City aims to achieve 35 per cent lower whole of life costs compared with transporting and landfilling waste. In doing so, the ARRC precinct will deliver a net CO₂ equivalent emissions reduction of 150,000 tonnes annually by incorporating local organics processing, reducing reliance on landfilling and coal-produced energy, and utilising hydrogen fuel for heavy fleet vehicles. The City's need to provide critical community infrastructure and sanitation services shall be met through adapting and innovating waste management practices to separate at source, as much as possible, recoverable resources in a sustainable and economical manner.

The seven facilities are as follows:

- 1) **Innovation Park:** The Innovation Park is a dedicated area of the precinct for recycling and sustainability focussed businesses to co-locate with the ARRC. The intention of the Innovation Park is to enable innovative and sustainable growth and entrepreneurship in the circular economy industry that will facilitate the continuous improvement of recoverable material recycling and reuse. The Innovation Park will be developed as individual units that can be developed and adapted to suit each tenant.
- 2) **Green hydrogen electrolysis plant:** Recycled water from neighbouring process water producers will be converted through electrolysis into hydrogen, which will supply a refuelling station for the City's waste collection and transporting fleet. The conversion of the City's fleet to hydrogen is a significant step towards achieving the City's Net Zero Plan.
- 3) **Recycling facility:** A Materials Recovery Facility (MRF) will receive the city's yellow-top recycling bins from kerbside collection. The MRF will use new technologies to reduce contamination when sorting and

increase the amount of recycled material that can be used to produce new products, such as glass, paper, and remanufactured plastics (e.g., traffic bollards).

- 4) **Construction and demolition waste recycling facility:** Recyclable construction and demolition materials will be processed into reusable materials, such as metals, concrete, asphalt, timber, and soils. Materials may be on sold to the construction industry and/or utilised in City projects to improve the sustainability of the City's construction footprint and truly deliver a circular economy.
- 5) **Organics processing facility:** Organic waste shall be collected and processed in a closed environment using in-vessel composting technology. In-vessel composting reduces greenhouse gas emissions through decomposition occurring in an enclosed environment and enables increased diversion of organics from landfill, which are one of the primary emitters of fugitive emissions such as methane. Organics received at the facility will be converted to new products, such as compost and mulch. The facility will be capable of processing food organics and green organics.
- 6) **Residual waste to energy facility:** The Residual WtE facility is the end of lifecycle for any residual waste materials that cannot be recovered and reprocessed. Residual waste will be thermally treated in a moving grate furnace to create steam that turns turbines to generate energy. The energy generated by the Residual WtE facility will offset 100 percent of the City's operational energy requirements, as well as power the ARRC precinct. Bottom ash recovered after thermal treatment will be collected for beneficial reuse, with metals extracted for further recycling and the residual ash converted to aggregate for use in road base and concrete products.
- 7) **Community education centre:** Community behavioural change and education is critical to the success of the circular economy. Embedded inside the ARRC, this centre will provide resources and information to schools and interested groups. It will also support training, education, and research opportunities to further establish the precinct as a leading sustainability hub.

3.1.2 Project Development and Staging

The ARRC precinct will be staged to enable the successful and sustainable delivery of each component. The timing of each component has been determined based on operational need (e.g., ageing existing infrastructure renewals and replacement requirements) and the ability for the construction industry to meet the timeframes for delivering each component over the next seven years. Appendix A – Master Plan of Designation Area shows the general proposed layout of the ARRC precinct and the area within which the development is proposed. The legend shows the precinct components, which have been further referenced and detailed in Table 14 below.

Table 14 ARRC Precinct and development components, with timing of construction and operations.

Precinct Component	Address (lot on plan and physical)	Timing
1. MRF	42 Quinns Hill Road East, Stapylton (6RP110743)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ¹

Precinct Component	Address (lot on plan and physical)	Timing
2. Innovation Park	8 Quinns Hill Road East, Stapylton (4RP110743) and 24 Quinns Hill Road East, Stapylton (5RP110743)	Site clearing: 2026/2027 Construction: 2028-2029 Operational: 2029
3. Sediment basins ³	Lot 2 Rossmanns Road, Stapylton (2SP171268)	Site clearing: 2026/2027 Construction: 2028-2031 Operational: 2032
4. Community Education Centre and Hydrogen Refuelling Station ³	Lot 2 Rossmanns Road, Stapylton (2SP171268)	Community Centre: Site clearing: 2026/2027 Construction: 2026-2027 Operational: 2027 Hydrogen Refuelling: Site clearing: 2026/2027 Construction: 2028-2030 Operational: 2030
5. Mono Cell Ancillary Infrastructure	Lot 1 Rossmanns Road, Stapylton (1SP171268) and Lot 2 Rossmanns Road, Stapylton (2SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴
6. Northern Mono Cell	Lot 1 Rossmanns Road, Stapylton (1SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴
7. Residual Waste to Energy Platform	Lot 1 Rossmanns Road, Stapylton (1SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴
8. Road Areas	Lot 1 Rossmanns Road, Stapylton (1SP171268) and Lot 2 Rossmanns Road, Stapylton (2SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴
9. Southern Mono Cell	Lot 2 Rossmanns Road, Stapylton (2SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴

Precinct Component	Address (lot on plan and physical)	Timing
10. Access Track	Lot 1 Rossmanns Road, Stapylton (1SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴
11. Southern Laydown and Ancillary Works Area	Lot 36 Christensen Road, Stapylton (36SP222486) Lot 12 Rossmanns Road, Stapylton (12SP109916)	Site clearing: 2026/2027 Construction: 2028-2030 Operational: 2030
12. Dam Wall Removal	Lot 1 Rossmanns Road, Stapylton (1SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴
13. Light Vehicle Access Road	Lot 1 Rossmanns Road, Stapylton (1SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴
14. Utilities Easement	Lot 1 Rossmanns Road, Stapylton (1SP171268) and Lot 2 Rossmanns Road, Stapylton (2SP171268)	Site clearing: 2026/2027 Construction: 2030-2032 Operational: 2032 ⁴

¹ The City's current MRF will be decommissioned prior to the commissioning and operation of the new Stapylton MRF. As the current facility remains operational, the timing of the new Stapylton MRF is such that it enables sustainability with delivery by the construction industry and responsible economic management. The site will be cleared, and land management implemented on receipt of Commonwealth and State planning approvals to enable efficiency in site preparations and management.

² The sediment basins form an integral part of the Residual WtE precinct and enable the environmentally responsible management of site stormwater across the site. The location of the sediment basins is still subject to detailed design development, surface water modelling, and the requirements of the site's mono cells. The location presented in Appendix A – Master Plan of Designation Area represents a worst-case scenario for the site with respect to environmental impacts.

³ The community centre is a key priority for the City to enable education and behaviour change to occur in the community before the Residual WtE facility becomes operational. The hydrogen refuelling area may be integrated into the Residual WtE precinct based on safety in design and detailed design development; however, the proposed location in Appendix A – Master Plan of Designation Area represents a worst-case scenario for the site with respect to environmental impacts.

⁴ All work associated with the residual WtE facility, including the mono cells, access roads, utilities, and easements, will be developed concurrently. Clearing of the land will occur once all approvals to do so have been granted and the site will be managed under a specific land management program until construction commences.

3.2 LGID Application and Additional Approval Requirements

3.2.1 LGID for ARRC

It is proposed that an LGID is applied across all lots listed in Table 13. Table 15 provides the detail for each precinct component, the lot on plan and physical address of that component, and the proposed infrastructure category under Schedule 5 of the Planning Reg.

Table 15 Precinct component, lot on plan, and proposed infrastructure category in accordance with Schedule 5 of the Planning Reg.

Address (lot on plan and physical)	Precinct Component	Schedule 5 Infrastructure Category	Justification
4RP110743 (8 Quinns Hill Road East, Stapylton)	Innovation Park	Part 2, 18 – waste management facilities	The Innovation Park provides facilities for small-scale recycling and waste management organisations to develop innovative solutions for recycling currently unrecyclable wastes.
5RP110743 (24 Quinns Hill Road East, Stapylton)	Innovation Park	Part 2, 18 – waste management facilities	The Innovation Park provides facilities for small-scale recycling and waste management organisations to develop innovative solutions for recycling currently unrecyclable wastes.
6RP110743 (42 Quinns Hill Road East, Stapylton)	MRF	Part 2, 18 – waste management facilities	The MRF receives source-separated recyclable waste for further processing and resource recovery.
1SP171268 (Lot 1 Rossmanns Road, Stapylton)	Northern mono cell and ancillary infrastructure Residual Waste to Energy Platform	Part 2, 18 – waste management facilities	The mono cells receive non-recyclable ash wastes for further processing and disposal. The ancillary infrastructure relates to the access roads and services required to safely operate the mono cells. The residual waste to energy platform receives and processes non-recyclable municipal wastes.

Address (lot on plan and physical)	Precinct Component	Schedule 5 Infrastructure Category	Justification
2SP171268 (Lot 2 Rossmanns Road, Stapylton)	Sediment basins Community Education Centre and hydrogen refuelling station Southern mono cell and ancillary infrastructure	Part 2, 3 – Community and cultural facilities, including community centres, galleries, libraries, and meeting halls Part 2, 6 – educational facilities Part 2, 18 – waste management facilities Part 2, 19 – water cycle management infrastructure Part 2, 20 – storage and works depots and similar facilities, including administrative facilities relating to the provision or maintenance of infrastructure stated in this part	The sediment basins receive and treat stormwater run-off from the site to prevent pollutants entering the surrounding environment. The Community Education Centre will also function as the precinct's head office, containing all administrative and management functions related to the operations and maintenance of the precinct. It will include community facilities, such as a repair hub and tool library, and host educational events centred around recycling and waste management. The mono cells receive non-recyclable ash wastes for further processing and disposal. The ancillary infrastructure relates to the access roads and services required to safely operate the mono cells.
12SP109916 (Lot 12 Rossmanns Road, Stapylton)	Southern laydown and ancillary works area	Part 2, 18 – waste management facilities Part 2, 20 – storage and works depots and similar facilities, including administrative facilities relating to the provision or maintenance of infrastructure stated in this part	The operations of the RWtE facility, composting facility (not subject to this LGID), and the ARRC precinct as a whole requires areas for administrative works, laydown areas for construction, operations, and ongoing maintenance, and space for managing materials.
36SP222486 (Lot 36 Christensen Road, Stapylton)	Southern laydown and ancillary works area		

Criteria for Making and Amending Designations

The Act (Chapter 2, Part 5, Section 36) sets out criteria for making and amending LGIDs. The criteria and how this proposal addresses each item is set out in Table 16 below.

Table 16 Response to Criteria for Making and Amending Designations

Criteria	Response
(1) To make a designation, a designator must be satisfied that – a) the infrastructure will satisfy statutory requirements, or budgetary commitments, for the supply of the infrastructure; or b) there is or will be needed for the efficient and timely supply of the infrastructure.	ShapingSEQ 2023, City of Gold Coast Towards Zero Waste 2025 – 2028 Plan, and Project Description and Need describe the need for efficient and timely supply of the infrastructure subject to the LGID proposal.
(2) To make or amend a designation, if the designator is the Minister, the Minister must also be satisfied that adequate environmental assessment, including adequate consultation, has been carried out in relation to the development that is the subject of the designation or amendment.	A full environmental assessment is provided in Environmental Impact Assessment and Management. Consultation is addressed in Sections 4 and 5.
(3) The Minister may, in guidelines prescribed by regulation, set out the process for the environmental assessment and consultation.	This report, including the environmental assessment and consultation strategy, has been prepared following the Minister's Guidelines and the prescribed requirements.
(4) The Minister is taken to be satisfied of the matters in subsection (2) if the process in the guidelines is followed.	This report has been prepared following the Minister's Guidelines and is therefore considered compliant with these.
(5) However, the Minister may be satisfied of the matters in another way.	This report has been prepared following the Minister's Guidelines and is therefore considered compliant with these.
(6) Sections 10 and 11 apply to the making or amendment of the guidelines as if the guidelines were a State Planning Policy.	This report and application are not related to an amendment.

Criteria	Response
<p>a) all planning instruments that relate to this premises; and</p> <p>b) any assessment benchmarks, other than in planning instruments, that relate to the development that is the subject of the designation or amendment; and</p> <p>c) If the premises are in a State development area under the <i>State Development Act</i> – any approved development scheme for the premises under that Act; and</p> <p>i. If the premises are in a priority development area under the <i>Economic Development Act 2012</i> – any development scheme for the priority development area under that Act; and</p>	<p>Legislative Context and Framework provides details of the planning instruments relevant to the premises subject.</p> <p>Addressed in State Planning Instruments.</p> <p>The premises subject of this report and the proposed designation do not occur in a State Development Area.</p> <p>The premises subject of this report and the proposed designation do not occur in a Priority Development Area.</p>
<p>(7) To make or amend a designation, a designator must have regard to –</p> <p>a) Any properly made submissions made as part of the consultation carried out under section 37; and</p> <p>b) The written submissions of any local government.</p>	<p>Properly made submissions relating to the designation will be considered in accordance with the Consultation Strategy provided in Section 5.</p> <p>This designation is being proposed by the City of Gold Coast and, therefore, the City is considered both the Infrastructure Entity and the Designator. As such, consultation with Local Government is occurring in parallel as part of this process.</p>

3.2.2 Commonwealth Approval

As described in Section 2.2.4, the proposed ARRC development occurs on numerous lots where MNES have been identified, assessment, and a Significant Impact Assessment (SIA) has determined that the Action is referable to DCCEEW under the EPBC Act. The ARRC project was referred to DCCEEW in January 2024 and on 3 May 2024, a delegate of the Minister for Water and Environment within DCCEEW determined the project to be a 'Controlled Action'. DCCEEW's delegate advised the City in a letter dated 23 May 2024 that further assessment of the Action would be required and completed via preliminary documentation. The letter included extensive details on the additional information and documentation required to complete the assessment. The

City finalised and submitted the Preliminary Documentation Information package in August 2025, which includes an Offsets Management Plan (OMP) and Offsets Strategy that have been prepared in accordance with the *Commonwealth Environmental Offsets Policy 2012* and the associated tools and calculators for determining offsets under the EPBC Act. In October 2025, DCCEEW provided a response to the Preliminary Documentation package with a request for additional information relating to certain aspects of the offset calculation, among other items. The City provided a comprehensive response and revision of the Preliminary Documentation package in December 2025. In February 2026, DCCEEW responded with some additional queries and information to be included in the Preliminary Documentation Package. Concurrently, the proponent and Person Undertaking the Action was amended to reflect the creation of the new Council-controlled entity – ARRC Organics Pty Ltd – as the entity responsible for the approval. A response to the second round of comments was prepared and submitted to DCCEEW in March 2026. ARRC is anticipating a final response and approval by mid-2026. Copies of the official documentation are available via the EPBC Public portal, with key documents also provided in Appendix B. Note that while the EPBC application now sits with ARRC Organics Pty Ltd, the LGID remains the responsibility of the City as the landowner.

3.2.3 Other State Approvals

Other State approvals will be required in addition to the LGID and outside of the ADPs once the LGID is made. These are likely to include numerous Environmental Authorities to facilitate operation of the ARRC precinct where activities are considered Environmentally Relevant under the EP Act. Once the detailed design of each precinct component is developed, a full assessment of approval requirements outside of the ADPs within the LGID will be completed and approvals sought as appropriate.

4. Environmental Impact Assessment and Management

4.1 Flora and Fauna

4.1.1 Purpose and Scope

Ecological assessments of the ARRC project area were completed to determine the following:

- Existing environment – including field-verification of mapped MNES, MSES, and Regional Ecosystems (REs)
- SIA – to MNES and MSES to determine the short term and permanent impacts and residual impact of the ARRC development on those verified during field surveys
- Mitigation measures to be employed to protect vegetation, fauna, and habitat to be retained or restored during construction and operations of the site.

The scope of the ecological assessments covered the eight lots described in Table 13 and included:

- Desktop assessment of Commonwealth (MNES), State (MSES) and local (MLES) ecology using publicly available databases to identify ecological matters with the potential of occurring in the project area.
- Seven flora and fauna field surveys, spanning numerous seasons to capture seasonal variations and season-specific species, with the intention of providing field verification of the desktop assessment findings and determining the likelihood of occurrence as well as presence/absence of flora and fauna species, as well as migratory species. The latest survey, completed in March 2026, comprised a Protected Plants survey to respond to the State requirement about protected plant trigger mapping and assessment.
- Preparation of two Ecological Assessment Reports – one specifically discussing MNES and findings relevant to the EPBC Act, and a second discussing MSES and other relevant State matters. Both reports completed SIAs utilising applicable methodologies depended on the purpose (MNES / MSES) using both the desktop assessment results and the finding from the numerous field surveys to determine likelihood and significance of impact.
- Development of an OMP, compliant with the Commonwealth Offsets Policy under the EPBC Act, that sets out the requirements for ensuring adequate offsets are provided for all MNES significantly impacted by the project.

4.1.2 Legislative Context

The ARRC project is relevant to numerous Commonwealth and Queensland State legislation with regards to ecology.

Commonwealth Legislation and Policy

Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act establishes a requirement for Commonwealth environmental assessment and approval for actions that are likely to have a significant impact on any MNES protected under the EPBC Act, including:

- World Heritage properties

-
- National heritage places
 - Wetlands of international importance (listed under the Ramsar Convention)
 - Listed threatened species and ecological communities
 - Migratory species protected under international agreements
 - Commonwealth marine areas
 - The Great Barrier Reef Marine Park
 - Nuclear actions (including uranium mines)
 - A water resource, in relation to coal seam gas development and large coal mining development.

Other matters protected under the EPBC Act include:

- The environment, where actions proposed are on, or will affect Commonwealth land and the environment
- The environment, where Commonwealth agencies are proposing to take an action.

When a proponent proposes to take an action that they believe may need approval under the EPBC Act, they must refer the proposed action to the Australian Government Minister for the Environment. The purpose of the referral is to determine whether a proposed action is a 'controlled action' and thereby requires approval under the EPBC Act. If the Minister for the Environment determines that a proposed action is a controlled action, it will proceed through the Commonwealth assessment and approval processes.

The ARRC project has been determined to be a Controlled Action under the EPBC Act and is currently undergoing further assessment by Preliminary Information.

EPBC Act Environmental Offset Policy

The EPBC Act Environmental Offsets Policy outlines the Commonwealth Government's approach to the use of environmental offsets under the EPBC Act. The Environmental Offsets Policy applies to project assessments and approvals under Parts 8 and 9 of the EPBC Act. The Environmental Offsets Policy provides a framework on the use of environmental offsets under the EPBC Act including when offsets are required, how offsets can be delivered, and the framework under which they operate. Offsets are not required for all approvals under the EPBC Act, and the Environmental Offsets Policy is only triggered when significant residual adverse impacts to matters protected under the EPBC Act are unavoidable. The Environmental Offsets Policy relates to all matters protected under the EPBC Act.

The Environmental Offsets Policy applies to offsetting requirements in both terrestrial and aquatic (including marine) environments. It requires that an environmental offset under the EPBC Act be suitable and 'delivers an overall conservation outcome that improves or maintains the viability of the protected matter(s).' The ARRC project has been determined to require offsets by the assessment officers at DCCEEW and an OMP has been produced in compliance with this requirement.

Relevant Queensland State Legislation

Nature Conservation Act 1992

The NC Act provides the legislative framework for the conservation of nature, including the protection of native wildlife and their habitats. The NC Act ensures that development activities are conducted in a manner that minimises impacts on biodiversity by regulating land use and managing protected areas. It mandates the

creation of management plans and permits for activities that might affect wildlife, promoting sustainable development practices aligning with the conservation of biodiversity and ecosystems.

Vegetation Management Act 1999

The VM Act and its subordinate regulation (*Vegetation Management Regulation 2000*) seeks to regulate the clearing of native vegetation that are regional ecosystems to prevent land degradation, prevent the loss of biodiversity and maintain ecological processes.

Biosecurity Act

Under the *Biosecurity Act 2014* landowners are responsible for taking all reasonable and practical steps to minimise the risks associated with invasive plants under their control. It is required that all sightings of prohibited invasive plants are reported to Biosecurity Queensland within 24 hours. In addition, everyone is required to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is called a general biosecurity obligation.

4.1.3 Methodology

Desktop Assessment

Database Searches

Searches and review of the following databases and web-based information sources were performed and, where relevant, a 10-kilometre search area surrounding the ARRC project site was applied, including:

- EPBC Protected Matters Search Tool (Commonwealth)
- Atlas of Living Australia online spatial portal (Commonwealth)
- Vegetation Management Property Report (Queensland Government), which includes:
 - Regulated vegetation management map
 - Vegetation management supporting map
 - Essential habitat table and map
 - Protected plants flora survey trigger map
 - WildNet Report
- Matters of State Environmental Significance Report (Queensland Government), which includes:
 - State conservation areas
 - Fish habitat areas
 - Wetlands and waterways
 - Threatened and near threatened flora and fauna
 - Koala habitat area
 - Regulated vegetation
 - Offset areas
- Queensland Waterways for Waterway Barrier Works spatial data layer and guideline (Queensland Globe).

Likelihood of Occurrence

MNES and MSES species identified in the desktop assessment have undergone a likelihood of occurrence assessment using the criteria set out in Table 17. This assessment evaluated information from the past 20 years relating to species habitat preferences, known or suspected distribution, database records, the occurrence of

suitable habitat based on desktop information, field verification of habitats and/or confirmed presence of species within the ARRC project area (i.e., known records).

Table 17 Likelihood of occurrence assessment criteria

Likelihood of Occurrence	Assessment Criteria
Low	<p>No previous records of the species within the area surrounding the project, and one or more of the following criteria is met:</p> <ul style="list-style-type: none"> • Not previously recorded in the area surrounding the project and the area is beyond the current known geographic range. • Dependent on specific habitat types or resources that are not present in the area surrounding the project. • Considered extinct in the wild.
Moderate	<p>Species previously recorded within the area surrounding the project area and one or more of the following criteria is met:</p> <ul style="list-style-type: none"> • Previously recorded in proximity to the project area (i.e., vagrant individuals). • Potential habitat resources are present in the area surrounding the project.
High	<p>Species previously recorded within the area surrounding the project and one or more of the following criteria is met:</p> <ul style="list-style-type: none"> • Previously recorded in the area surrounding the project. • Dependent on habitats or habitat resources that are available in the area surrounding the project. • Suitable habitats are available in the area surrounding the project and are capable of supporting a resident population or individuals of the species.
Recorded	<p>Flora species or ecological community positively identified during field surveys within the area surrounding the project.</p>
Recorded / Known	<p>Flora species or ecological community identified during previous field surveys within the area surrounding the project, but not recorded during current surveys. Fauna species positively recorded during previous field surveys within the area surrounding the project or adjacent habitat, but not recorded during the current surveys.</p> <p>Previous recent 'known' records in area surrounding the project, but not recorded during the current surveys.</p>

Field Surveys

A total of six seasonal flora and fauna surveys have been completed for the project between September 2021 and July 2024, which in combination provides a comprehensive survey effort for the targeted MNES and MSES species, whereby if certain species, such as threatened flora species with moderate or higher likelihood of occurrence would have been recorded if present. Additionally, 13 BioCondition surveys were conducted across the project footprint area in 2024 to inform the EPBC compliant OMP. The survey effort is detailed in Table 18.

A key output from the surveys was to confirm the extent of field verified vegetation communities and associated habitats for MNES and MSES within the area surrounding the project. The flora and fauna survey methods and effort were informed by the initial desktop-based likelihood of occurrence assessment using the criteria set out in Table 17. Surveys were then performed targeting threatened species assessed as having a moderate or higher likelihood of occurring in the area around the project. The initial desktop-based likelihood of occurrence assessment was updated following the field survey, as informed by field verification survey results.

Table 18 Seasonal flora and fauna survey effort

Date	Season	Effort	Specialists	Location (lot on plan)	Surveys Completed
14 – 15 September 2021 and 12 – 15 October 2021	Dry	8 days / 6 nights	Principal Ecologist – Zoologist Principal Ecologist – Botanist Senior Ecologist – Zoologist Senior Ecologist – Botanist	36SP222486 12SP109916 2SP171268 1SP171268 1RP6936 2RP209307 (Stapylton Landfill) 3RP209307 (Stapylton Landfill) 2RP153665 (Stapylton Landfill)	Targeted threatened species surveys TEC and RE verification
7 – 11 February 2022	Wet	4 days / 3 nights	Principal Ecologist – Zoologist Senior Ecologist – Botanist Ecologist – Zoologist Graduate Ecologist – Botanist	36SP222486 12SP109916 2SP171268 1SP171268 1RP6936 2RP209307 (Stapylton Landfill) 3RP209307 (Stapylton Landfill) 2RP153665 (Stapylton Landfill)	Targeted threatened species surveys TEC and RE verification
1 – 5 May 2023	Wet	5 days	Associate Ecologist – Zoologist Principal Ecologist – Botanist Ecologist – Botanist Ecologist – Zoologist	36SP222486 12SP109916	BioCondition assessment

Date	Season	Effort	Specialists	Location (lot on plan)	Surveys Completed
25 – 28 July 2023	Dry	4 days / 2 nights	Associate Ecologist – Zoologist Principal Ecologist – Zoologist Senior Ecologist – Botanist Graduate Ecologist – Zoologist	36SP222486 12SP109916	Koala tree counts TEC and RE verification
16 – 20 October 2023	Dry	5 days / 4 nights	Principal Ecologist – Zoologist Senior Ecologist – Botanist Ecologist – Zoologist Graduate Ecologist – Botanist	36SP222486 12SP109916 2SP171268 1SP171268 1RP6936 2RP209307 (Stapylton Landfill) 3RP209307 (Stapylton Landfill) 2RP153665 (Stapylton Landfill)	Targeted threatened species surveys TEC and RE verification
1 – 3 July 2024	Dry	3 days / 2 nights	Principal Ecologist – Zoologist Senior Ecologist – Botanist Senior Ecologist – Zoologist Graduate Ecologist – Botanist	4RP110743 6RP110743	Targeted threatened species surveys TEC and RE verification
26 – 30 August 2024	Dry	5 days	Associate Ecologist – Biologist Principal Ecologist – Zoologist	36SP222486 12SP109916 2SP171268 1SP171268 1RP6936 4RP110743 6RP110743	BioCondition Assessments

Date	Season	Effort	Specialists	Location (lot on plan)	Surveys Completed
11 December 2024	Wet	1 day	Associate Ecologist – Botanist	4RP110743 5RP110743 6RP110743	Habitat assessment BioCondition assessment RE verification
9 – 13 February 2026	Wet	6 days	Associate Ecologist / Zoologist Associate Ecologist / Botanist	2SP171268 1SP171268 4RP110743 5RP110743 6RP110743	Protected Plants flora survey

Field Verification Methodologies

The purpose of the field verification surveys was to determine the extent and type of vegetation communities and REs in the area surrounding the project. The field survey effort is shown in Figure 11 and Figure 12. These surveys were conducted in accordance with the Methodology for Survey and *Mapping Vegetation Communities and Regional Ecosystems in Queensland* (Neldner *et. al.*, 2022). A total of 100 quaternary level and seven tertiary level vegetation surveys were conducted across the area surrounding the project during the field investigations. Patches of advanced regrowth vegetation were assessed using quaternary level vegetation surveys to confirm remnant status against benchmarks for the relevant REs. Tertiary-level surveys were conducted to confirm the presence/absence of the TECs against key diagnostic characteristics and condition thresholds specified by the approved conservation advice for the vegetation communities within the Study Area that align with the TECs revealed by database searches. Field verified vegetation communities and regulated vegetation (REs) were mapped based on the results of the field surveys, using ArcGIS Version 10.4 software, and ECW aerial images captured at a scale of 1:10,000.

Targeted random meander surveys for threatened MNES and MSES flora species were conducted across the area surrounding the project during all seasonal field surveys. Particular attention was paid to MNES and MSES flora species assessed as having a moderate or higher likelihood of occurring in the area surrounding the project.

The targeted fauna surveys were conducted in habitats known to typically support the target MNES and MSES fauna species. The survey methods and effort were developed in reference to State and Commonwealth survey guidelines to determine the level of adequate survey for the target species. The targeted fauna survey methods were limited to detection-based surveys only, with no trapping undertaken. Trapping was deemed unnecessary for the target fauna species of potential relevance to the project area and based upon the habitats proposed to be impacted.

Habitat assessments were conducted at 26 locations surrounding the project area during the field investigations. Each habitat area was assessed for the presence / absence of micro-habitat features. Additionally, the abundance of these habitat features was estimated where applicable and categorised, for example, by the size and type of tree hollows. The habitat areas were then assessed for their suitability to support threatened species in reference to the habitat features present, vegetation types, and foraging or prey resources. The habitat assessments also identified any evidence of habitat degradation, such as grazing, weed infestations, and soil erosion. Koala habitat assessments were undertaken at each fauna habitat assessment site and were based on consideration of both Commonwealth and State koala habitat definitions.

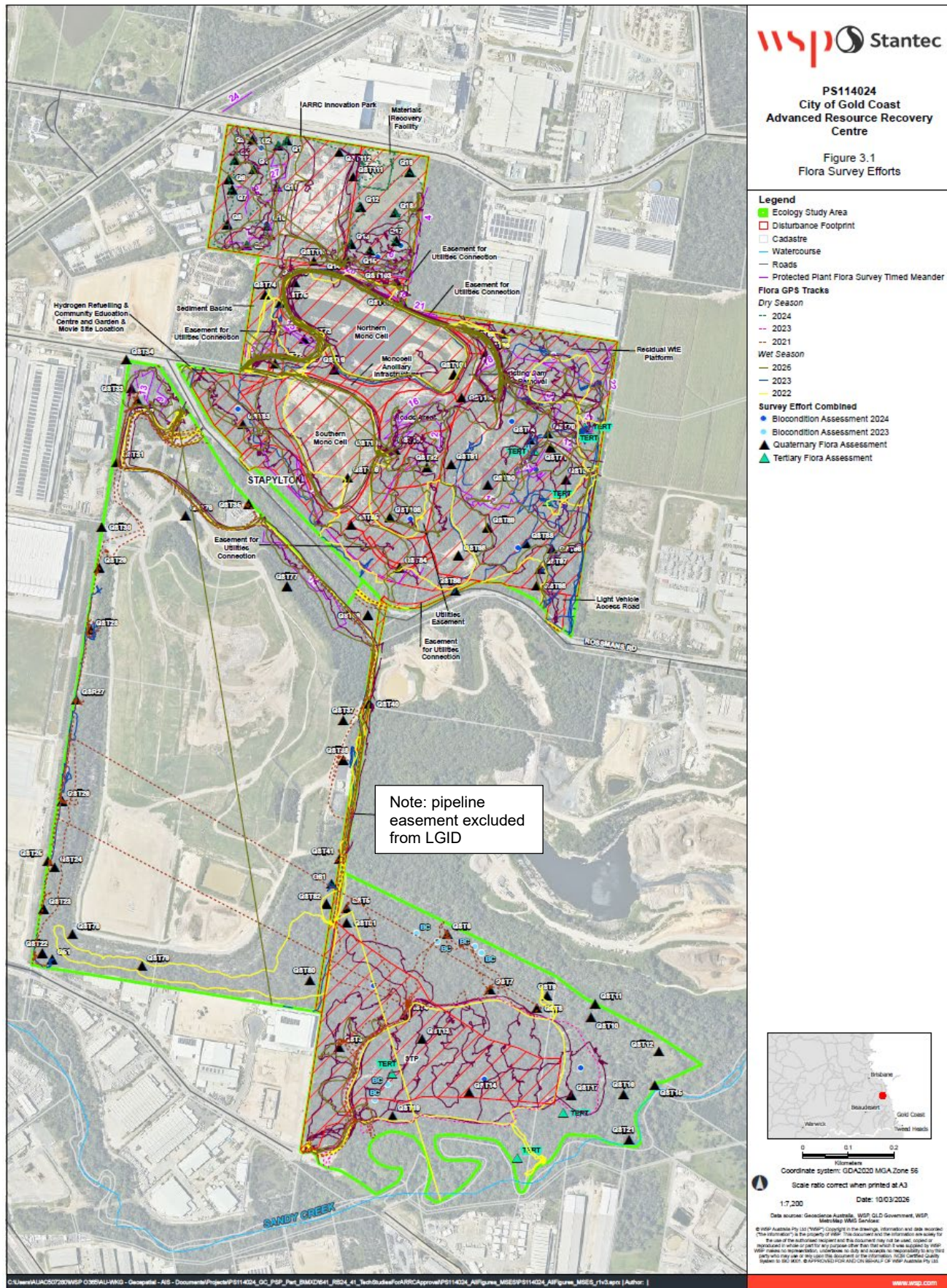


Figure 11 Ecology field survey effort – flora

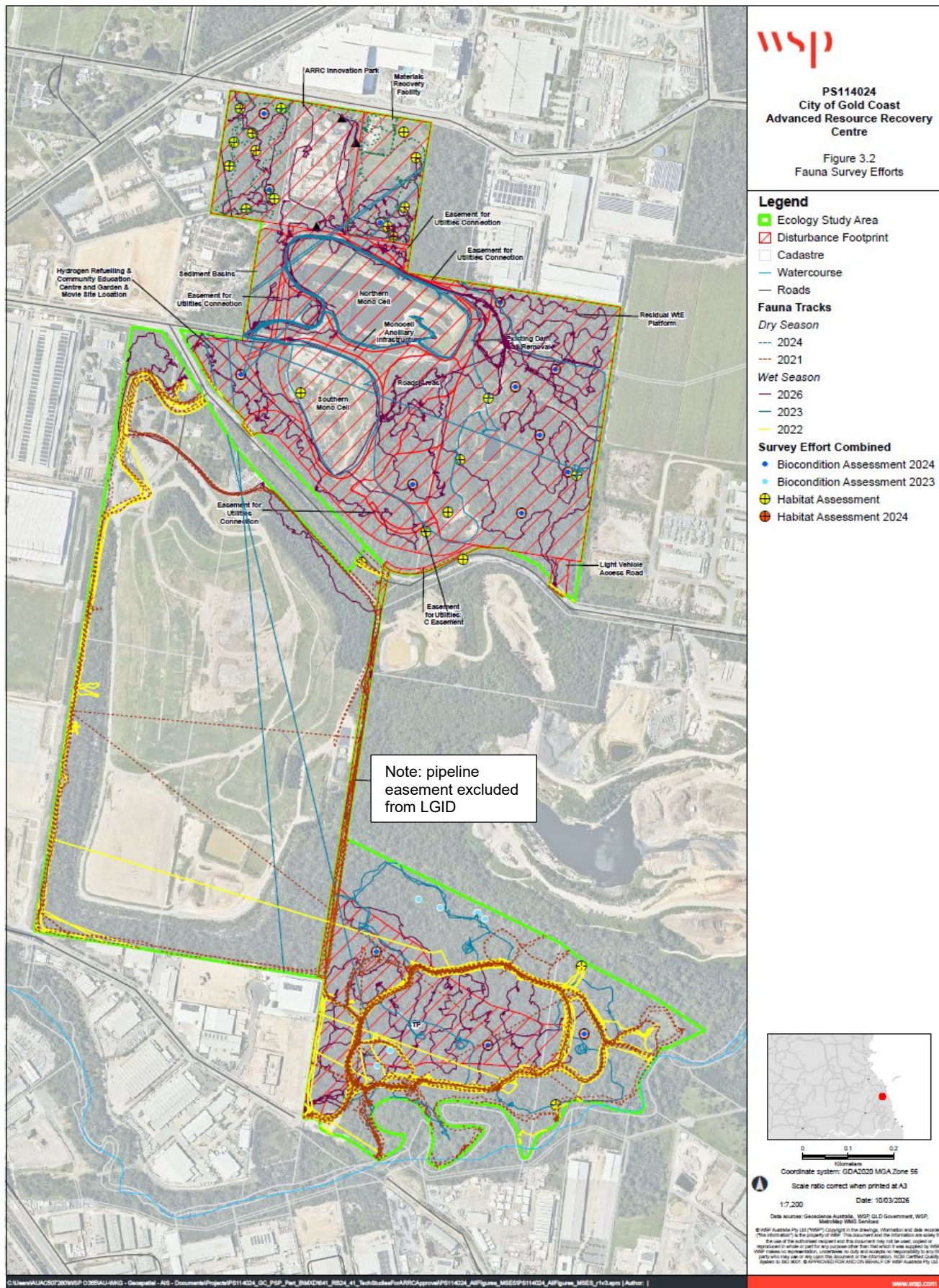


Figure 12 Ecology field survey effort – fauna

4.1.4 Desktop Findings

Results of the desktop searches that are relevant to the terrestrial fauna and flora survey and this ecological assessment are presented below.

Matters of National Environmental Significance

The MNES of relevance to the Study Area has been informed by the results of the EPBC Act data searches undertaken and are presented in.

Table 19 Summary of MNES database search results for the area surrounding the project

MNES	Status	Presence / Absence
World Heritage Properties		
None		
National Heritage Places		
None		
Wetlands of International Importance		
Moreton Bay	NA	Ramsar is located more than 5 kilometres downstream of the project. The southern portion of the project area is hydrologically connected by Sandy Creek to the Logan River, which flows into the Moreton Bay Ramsar.
Threatened Ecological Communities		
Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community	Endangered	Ecological community may occur within area surrounding project.
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Ecological community likely to occur within area surrounding project.
Grey box-grey gum wet forest of subtropical eastern Australia	Endangered	Ecological community may occur within area surrounding project.
Lowland Rainforest of Subtropical Australia	Critically Endangered	Ecological community may occur within area surrounding project.

MNES	Status	Presence / Absence
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Ecological community likely to occur within area (in buffer area only).
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Ecological community likely to occur within area surrounding project.
Swamp Tea-tree (<i>Melaleuca irbyana</i>) Forest of South-east Queensland	Critically Endangered	Ecological community may occur within area surrounding project.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Ecological community may occur within area surrounding project.
Threatened Species		
116 species	Varies	Search results are contained within the Ecological Assessment Reports for MNES and MSES, which can be provided on request.
Migratory Species (excluding marine species)		
79 species	Varies	Search results are contained within the Ecological Assessment Reports for MNES and MSES, which can be provided on request.

State-mapped MSES

Mapped MSES are presented in Table 20. Only MSES present within the project area and immediate surrounds have been listed.

Table 20 Summary of MSES mapped within the project area and surrounds

MSES	Presence / Absence
Wetland Values	
High Ecological Significance Wetlands	Present in the margins of: Lot 36 on SP222486 Lot 12 on SP109916
Regulated vegetation (defined watercourse)	Present on: Lot 36 on SP222486 Lot 12 on SP109916 Lot 4 on RP110743
Waterways for waterway barrier works	Low risk unnamed tributary along the edges of: Lot 36 on SP222486 Lot 12 on SP109916
Wildlife Habitat	
Special Least Concern	One or more special Least Concern taxa recorded, scattered across site (all lots)
Endangered or Vulnerable	Core habitat for one or more Critically Endangered/Endangered/Vulnerable taxa, present on: Lot 1 on SP171268 Lot 2 on SP171268 Lot 36 on SP222486 Lot 12 on SP109916
SEQ Koala habitat – core	Scattered across site (all lots)
Essential Habitat	Scattered across site (all lots)
Wildlife Habitat	
Category B – Endangered or Of Concern	Small patches present on: Lot 36 on SP222486

MSES	Presence / Absence
	Lot 12 on SP109916 Lot 1 on SP171268
Regulated vegetation (100 m from wetland)	Present on: Lot 36 on SP222486 Lot 12 on SP109916
Protected plants trigger map	Present on: Lot 4 on RP110743 Small patch on Lot 5 on RP110743 Lot 6 on RP110743 Lot 1 on SP171268 Lot 2 on SP171268 Lot 1 on RP6936 (adjacent to project area on Stapylton Landfill) Lot 3 on RP209307 (adjacent to project area on Stapylton Landfill) Lot 2 on RP209307 (adjacent to project area on Stapylton Landfill) Lot 2 on RP153665 (adjacent to project area on Stapylton Landfill)

Regulated Vegetation

The area surrounding the project is currently mapped by the State Government as containing Least Concern and Of Concern remnant regional ecosystems listed under the VM Act, as well as non-remnant vegetation (Figure 13). Some of the State mapped REs may be representative of TECs listed under the EPBC Act (Table 19).

Table 21 State-mapped REs on and around the project site

Regional Ecosystem	Description	VM Act Status	Equivalent TEC (EPBC Act)
12.3.11	<i>Eucalyptus tereticornis</i> +/- <i>Eucalyptus siderophloia</i> , <i>Corymbia intermedia</i> open forest on alluvial plains usually near coast	Of Concern	Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions
12.3.6	<i>Melaleuca quinquenervia</i> +/- <i>Eucalyptus tereticornis</i> , <i>Lophostemon suaveolens</i> , <i>Corymbia intermedia</i> open forest on coastal alluvial plains	Least Concern	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland
12.11.3	<i>Eucalyptus siderophloia</i> , <i>E.</i> <i>propinqua</i> +/- <i>E. microcorys</i> , <i>Lophostemon confertus</i> , <i>Corymbia intermedia</i> , <i>E.</i> <i>acmenoides</i> open forest on metamorphics +/- interbedded volcanics	Least Concern	None
12.11.3a	<i>Lophostemon confertus</i> +/- <i>Eucalyptus microcorys</i> , <i>E.</i> <i>carnea</i> , <i>E. propinqua</i> , <i>E. major</i> , <i>E.</i> <i>siderophloia</i> woodland. Occurs in gullies and exposed ridges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and	Least concern	None

Regional Ecosystem	Description	VM Act Status	Equivalent TEC (EPBC Act)
	interbedded volcanics. Not a Wetland.		
12.11.5	<i>Corymbia citriodora</i> subsp. <i>variegata</i> woodland to open forest +/- <i>Eucalyptus siderophloia</i> / <i>E. crebra</i> , <i>E. carnea</i> , <i>E. acmenoides</i> , <i>E. propinqua</i> on metamorphics +/- interbedded volcanics	Least Concern	None
12.11.24	<i>Eucalyptus carnea</i> or <i>E. tindaliae</i> , <i>Corymbia intermedia</i> +/- <i>E. siderophloia</i> or <i>E. crebra</i> woodland on metamorphics +/- interbedded volcanics	No concern at present	None

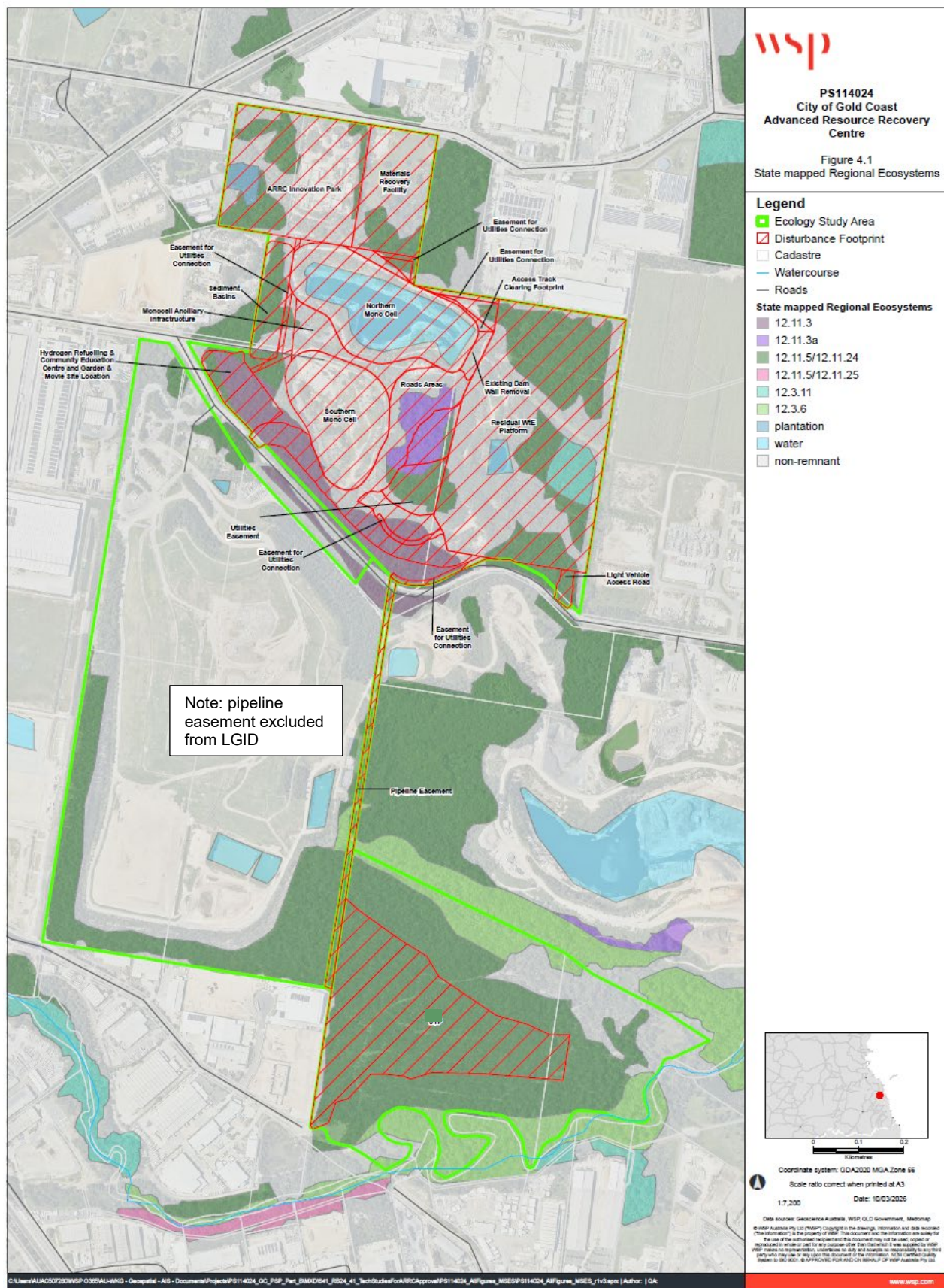


Figure 13 State-mapped REs in and surrounding the project area

4.1.5 Field Survey Findings

Vegetation Communities and Regulated Vegetation (REs)

Field surveys determined that the vegetation conditions varied from lightly disturbed, very disturbed, to cleared, with much of the vegetation in relatively good condition, particularly the Ironbark and Spotted Gum vegetation communities dominate the remnant vegetation. The structure of the remnant vegetation is variable and is reflective of past disturbances and past bushfire events, particularly a high intensity bushfire in 2019. As a result, a very dense shrub layer of *Acacia* spp. is present in areas that have experienced high intensity bushfire in previous years, and lesser so in areas previously cleared. These vegetation communities have also been subject to historical harvesting of fence post sized trees, but are otherwise intact and relatively weed free, with a predominantly native groundcover. Moreover, anecdotal observations suggest previously cleared and bushfire impacted areas are partly regenerating and provide ecosystem processes, such as regeneration, seed dispersal and nutrient cycling. Consequently, the remnant vegetation and associated habitats still provide viable or potential habitat for threatened species. Some of the vegetation communities have not yet advanced to remnant status and have been classified as high-value regrowth (HVR).

The adjacent land-uses also provide some limited connectivity to similar habitat in the surrounding landscape. This is mainly provided via riparian corridors and contiguous remnant vegetation, which are limited within the local area that has been subject to high levels of industrial, urban, and rural developments. A summary of the field verified vegetation communities and regulated vegetation (REs) identified has been provided below in Table 22. The location and extent of the field verified vegetation communities and regional ecosystems is presented in Figure 14.

There were several inconsistencies identified during field surveys between the State-mapped extent of REs and the vegetation communities and corresponding REs field verified, likely due to the difference of scale between regulated vegetation mapping (approximate 1:25,000) and the scale of the mapping and surveys prepared for the project (1:10,000). Furthermore, field surveys completed reassigned REs to Queensland Herbarium mapped REs based on the species composition appropriate to the descriptions.

Table 22 Field verified vegetation communities and REs surrounding and within the project.

Vegetation Community	Regional Ecosystem	Status	Description	VM Act Status	EPBC Act TEC
<i>Eucalyptus tereticornis</i> woodland on alluvial plains	12.3.11	Remnant	<i>Eucalyptus tereticornis</i> +/- <i>Eucalyptus siderophloia</i> , <i>Corymbia intermedia</i> open forest on alluvial plains usually near coast	Of Concern	Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions TEC
		HVR			
<i>Eucalyptus tereticornis</i> woodland on Pleistocene alluvial terrace	12.3.11b	Remnant	<i>Eucalyptus tereticornis</i> and/or <i>E. racemosa</i> subsp. <i>racemosa</i> +/- <i>E. siderophloia</i> , <i>Lophostemon suaveolens</i> , <i>E. seeana</i> , <i>E. fibrosa</i> subsp. <i>fibrosa</i> , <i>E. propinqua</i> and <i>Angophora leiocarpa</i> open forest usually with a dense shrub layer dominated by <i>Melaleuca nodosa</i> and/or <i>Leptospermum polygalifolium</i> .	Of Concern	Potentially Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions TEC
		HVR			
	12.3.6	Remnant	<i>Melaleuca quinquenervia</i> +/- <i>Eucalyptus tereticornis</i> , <i>Lophostemon suaveolens</i> ,	Least Concern	

Vegetation Community	Regional Ecosystem	Status	Description	VM Act Status	EPBC Act TEC
<i>Melaleuca quinquenervia</i> open forest on alluvial plains		HVR	<i>Corymbia intermedia</i> open forest on coastal alluvial plains		Potentially Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland TEC
<i>Eucalyptus seeana</i> woodland on metasediments	12.11.27	Remnant	<i>Eucalyptus seeana</i> woodland on metasediments	Endangered	NA
<i>Eucalyptus fibrosa</i> subsp. <i>fibrosa</i> woodland on metasediments	12.11.25	Remnant	<i>Corymbia henryi</i> and/or <i>Eucalyptus fibrosa</i> subsp. <i>fibrosa</i> +/- <i>E. crebra</i> , <i>E. carnea</i> , <i>E. tindaliae</i> woodland on metamorphics +/- interbedded volcanics	Of Concern	NA
<i>Eucalyptus siderophloia</i> woodland on metasediments	12.11.3	Remnant	<i>Eucalyptus siderophloia</i> woodland on metasediments	Least Concern	NA
		HVR			
<i>Eucalyptus siderophloia</i> woodland on metasediments	12.11.3a	Remnant	<i>Lophostemon confertus</i> +/- <i>Eucalyptus microcorys</i> , <i>E. carnea</i> , <i>E. propinqua</i> , <i>E. major</i> , <i>E. siderophloia</i> woodland.	Least Concern	NA

Vegetation Community	Regional Ecosystem	Status	Description	VM Act Status	EPBC Act TEC
<i>Corymbia citriodora</i> subsp. <i>variegata</i> woodland on metasediments	12.11.5	Remnant	<i>Corymbia citriodora</i> subsp. <i>variegata</i> woodland to open forest +/- <i>Eucalyptus siderophloia</i> /E. <i>crebra</i> , E. <i>carnea</i> , E. <i>acmenoides</i> , E. <i>propinqua</i> on metamorphics +/- interbedded volcanics	Least Concern	NA
		HVR			
<i>Eucalyptus crebra</i> woodland on metasediments	12.11.7	Remnant	<i>Eucalyptus crebra</i> woodland on metamorphics +/- interbedded volcanics	Least concern	NA
Non-remnant regrowth	NA	Non-remnant	NA	NA	NA
Cleared open areas	NA	Non-remnant	NA	NA	NA
Water	NA	Non-remnant	NA	NA	NA

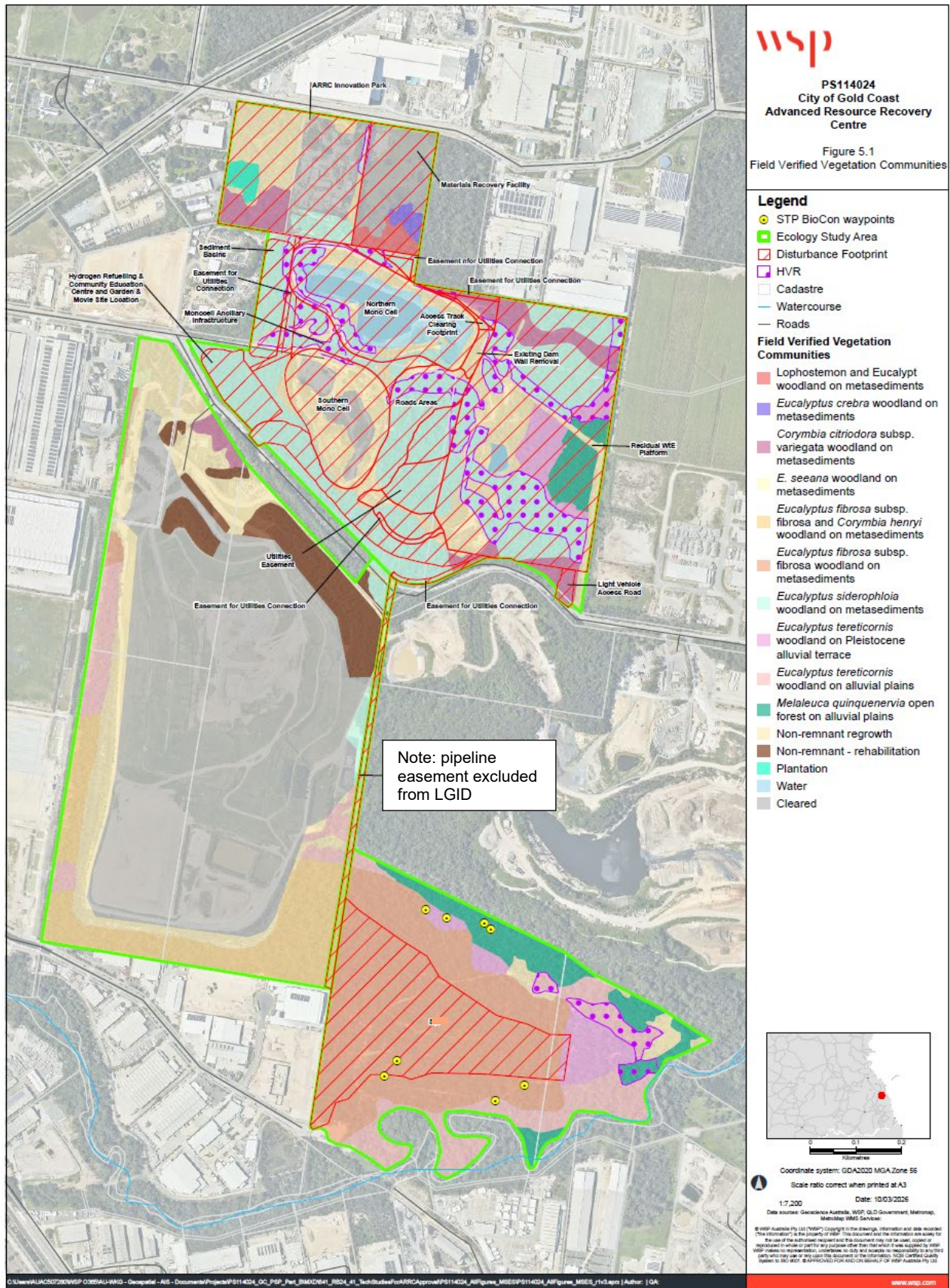


Figure 14 Field-verified REs and vegetation communities

Threatened Ecological Communities

Two TECs listed as MNES under the EPBC Act were confirmed as present in the project area, against key diagnostic characteristics and condition thresholds for relevant patches of the TECs:

- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland listed as Endangered under the EPBC Act – approximately 5.7 ha in project study area.
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions listed as Endangered under the EPBC Act – approximately 13.1 ha in project study area.

No other TECs identified in the desktop database search were identified within the project survey area.

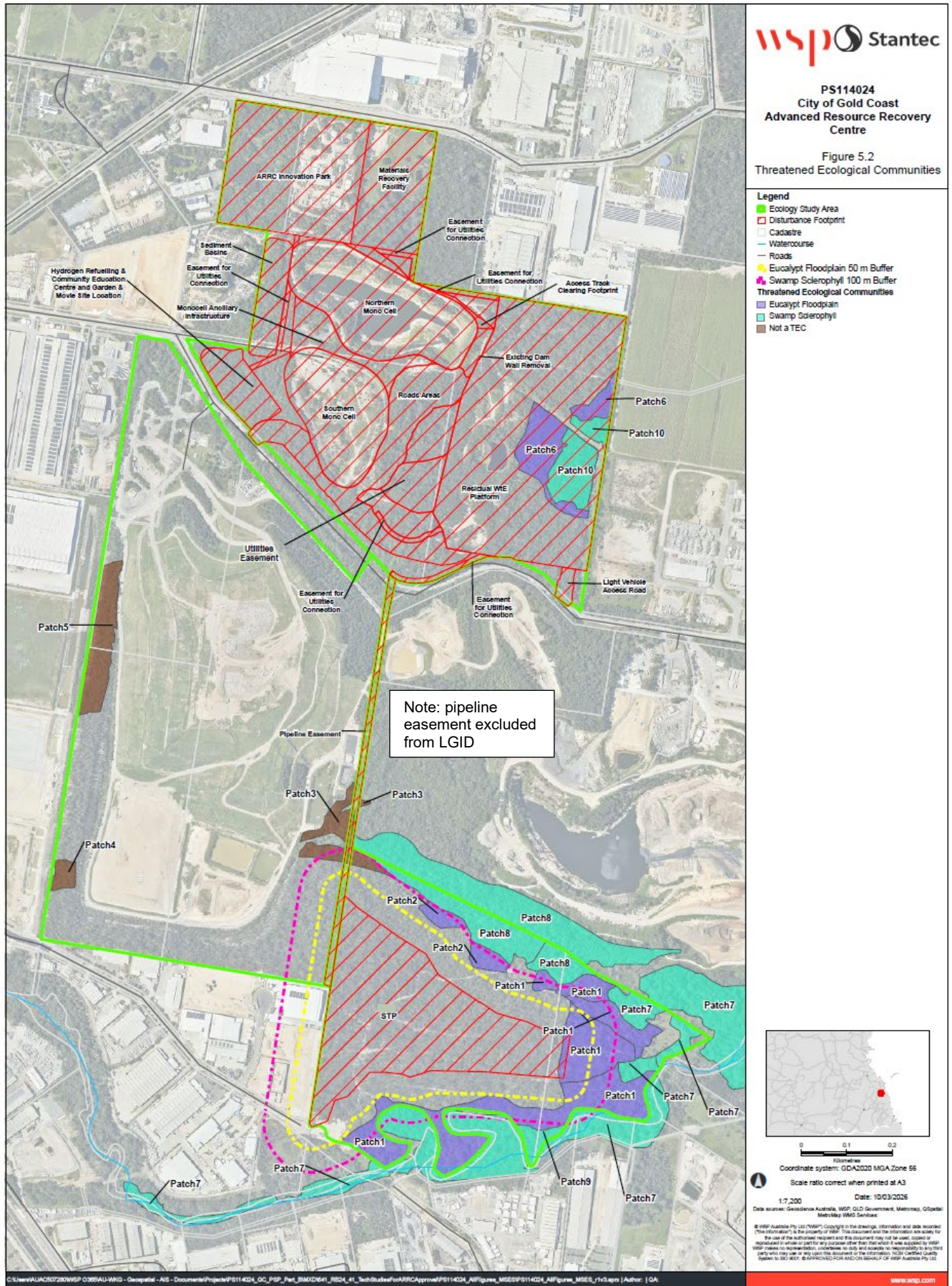


Figure 15 Field-verified TECs occurring within the project area

Flora Species

A total of 285 flora species were recorded within the project study area during targeted flora surveys, including 93 non-native flora species.

Threatened Flora Species

Despite comprehensive seasonal surveys targeting threatened flora species with a particular focus on species assessed as having a moderate to high likelihood of occurrence, no threatened flora species were recorded during the seasonal flora surveys. This comprehensive survey effort indicates that the threatened flora species identified by the likelihood of occurrence assessment are not present within the project area and are unlikely to be at risk of project-related impacts.

Invasive Plants

A total of 14 flora species listed under the Queensland *Biosecurity Act* and/or Weeds of National Significance were recorded within the project area. Non-alluvial areas generally had a lower coverage of exotic flora while alluvial areas including riparian had a general dominance of exotic flora in the ground and shrub layer.

Fauna Species

A total of 165 fauna species were recorded during the field surveys, including, 114 birds, 23 mammals, 12 reptiles, and 16 amphibian species. Of the species recorded, seven were introduced species, including:

- Cane toad (*Rhinella marina*)
- Common myna (*Acridotheres tristis*)
- Rock dove (*Columba livia*)
- European hare (*Lepus europaeus*)
- Black rat (*Rattus rattus*)
- Red fox (*Vulpes vulpes*)
- Asian house gecko (*Hemidactylus frenatus*)

Domesticated or feral cats and dogs are also likely to be periodically present but were not sighted during surveys.

Threatened Fauna Species

Grey-headed flying-fox (*Pteropus poliocephalus*) – listed as Vulnerable under the EPBC Act – were recorded during the field surveys, as shown on Figure 16.

The koala (*Phascolarctos cinereus*) listed as Endangered under the EPBC Act, was not visually recorded in potential Koala habitat during the targeted fauna surveys but is likely to use the habitat within the project area periodically as evidenced by potential scratch marks on a *Eucalyptus tereticornis*, and scats under a *E. microcorys*, both recognised in the region as primary food tree species for the Koala (Youngentob et al. 2021).

The south-eastern glossy black-cockatoo, listed as Vulnerable under the EPBC Act, is likely to use the area as foraging habitat. Although there were no observations and no evidence of site usage by the south-eastern glossy black-cockatoo during field surveys, the species may utilise the area periodically. The seeds of *Allocasuarina littoralis* and *Allocasuarina torulosa* are a preferred food source of the south-eastern glossy

black-cockatoo (GBC, 2024). Both species occur within the project area providing a potential food source for the south-eastern glossy black-cockatoo.

Habitat Assessment

The project area is comprised of several fauna habitat types associated with remnant, regrowth and non-remnant vegetation, watercourses and water bodies. Some of these habitats contain hollow bearing trees and stags, woodpiles, exfoliating bark and thick ground vegetation and leaf litter. A summary of field verified habitats, corresponding regional ecosystems and relevant MNES fauna species is provided in Table 23 and presented in Figure 16.

Table 23 Fauna habitat types, corresponding vegetation communities, and potential for threatened species to utilise project area (with extent)

Fauna Habitat Types	Corresponding RE	Potential Habitat for Threatened Species	Extent in Project Study Area (ha)
Melaleuca swamp forest	12.3.6 – <i>Melaleuca quinquenervia</i> and <i>Eucalyptus tereticornis</i> open forest on coastal alluvial plains	<ul style="list-style-type: none"> • Koala • Grey-headed Flying-fox • Rufous fantail • Satin flycatcher 	5.7
Eucalyptus / Melaleuca alluvial (riparian) forest	12.3.11 – <i>Eucalyptus tereticornis</i> woodland on alluvial plains	<ul style="list-style-type: none"> • Koala • Grey-headed Flying-fox • Rufous Fantail • Satin flycatcher 	13.1
	12.3.11b – <i>Eucalyptus tereticornis</i> woodland on Pleistocene alluvial terrace		
Eucalypt woodland	12.11.3 – <i>Eucalyptus siderophloia</i> woodland on metasediments	<ul style="list-style-type: none"> • Koala • Grey-headed Flying-fox • Rufous Fantail • Satin flycatcher 	62.1
	12.11.3a – <i>Lophostemon confertus</i> +/- <i>Eucalyptus microcorys</i> , <i>E. carnea</i> , <i>E. propinqua</i> , <i>E. major</i> , <i>E. siderophloia</i> woodland		
	12.11.5 – <i>Corymbia citriodora</i> subsp. <i>variegata</i> woodland on metasediments	<ul style="list-style-type: none"> • South-eastern Glossy Black-cockatoo (RE 12.11.3, 12.11.3a & 12.11.25 only) 	57.0
	12.11.25 – <i>Eucalyptus fibrosa</i> subsp. <i>fibrosa</i> woodland on metasediments 12.11.27 – <i>Eucalyptus seeana</i> woodland on metasediments		

Fauna Habitat Types	Corresponding RE	Potential Habitat for Threatened Species	Extent in Project Study Area (ha)
	12.11.7 – <i>Eucalyptus crebra</i> woodland on metamorphics +/- interbedded volcanics		
Non-remnant regrowth	Non-remnant regrowth	<ul style="list-style-type: none"> • Koala • Grey-headed Flying-fox • Rufous Fantail • Satin flycatcher 	25.8
Rehabilitation regrowth	Non-remnant rehabilitation and regrowth vegetation	<ul style="list-style-type: none"> • Koala • Grey-headed Flying-fox • Rufous Fantail • Satin flycatcher 	5.0
Total in Project study area (ha)			111.7

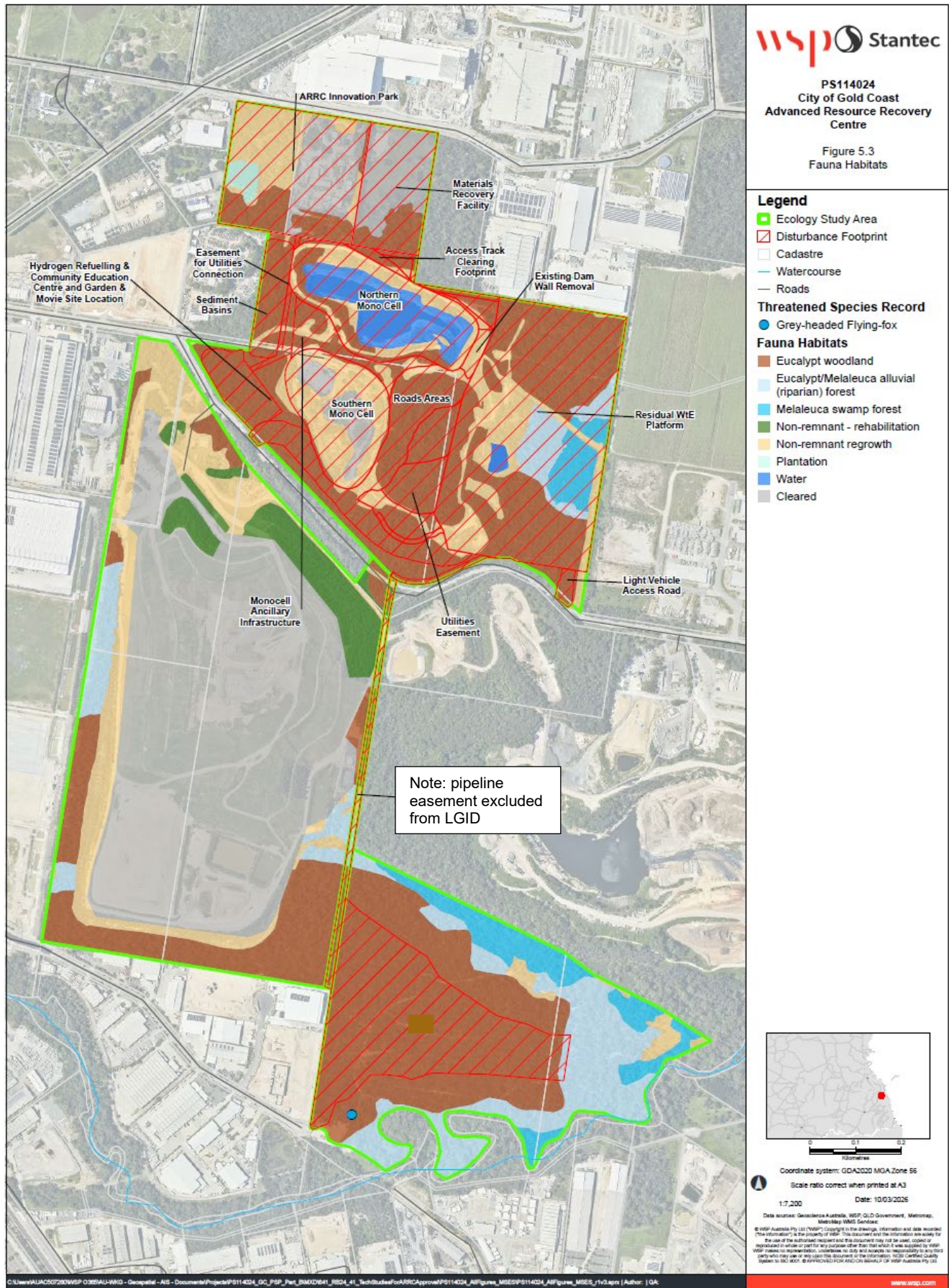


Figure 16 Threatened fauna sightings and field verified habitat

Connectivity

Connectivity within the project area is relatively high due to the vegetation consisting, in the most part, as one patch of habitat, which is only disconnected by Rossmanns Road. However, the connectivity of the project area to surrounding habitat very limited as it has been highly fragmented due to various past and current land uses, primarily industrial development.

The project area is surrounded by industrial development, urban and rural development, and cropping (sugar cane). There are opportunities for arboreal, terrestrial, and aquatic species to disperse southeast from the southern portion of the project area along Sandy Creek to large areas of viable habitat, where they can then move along regional and state corridors. However, connectivity along Sandy Creek to this habitat becomes thin in places, intersects several road barriers, and runs alongside industrial areas, making it less likely for fauna to disperse and move between these areas easily, safely, and effectively. Fauna may also disperse northwards through corridors between the project area and Yellowwood Reserve. However, connectivity past Yellowwood Reserve is limited for ground-dwelling fauna due to the large river barrier without crossing opportunities and lack of adjoining habitat along the south side of the river.

Disturbance-sensitive species may be less likely to disperse through the area surrounding the project due to high disturbance levels from roads and traffic and industrial areas, creating small, isolated patches of habitat.

There is high quality habitat in the ranges/Gold Coast hinterland west of the project; however, connectivity to this habitat is only moderate for highly mobile species (birds) with low gap crossing ability due to the fragmented nature of the wider surroundings.

4.1.6 Likelihood of Occurrence and Impact Assessments

Likelihood of Occurrence Assessment

Utilising species records, the field survey results, and the habitat identification during field assessments, the likelihood of occurrence assessment completed during the desktop assessment was updated to identify the threatened flora and fauna species with potential to occur in the project area. The updated assessment is provided in Table 24.

Table 24 Likelihood of occurrence assessment

Ecological Aspect / Name	Conservation Status (Act)	Likelihood of Occurrence
Threatened Ecological Communities		
Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community	Endangered (EPBC)	Low – corresponding regional ecosystems are absent within the project area.

Ecological Aspect / Name	Conservation Status (Act)	Likelihood of Occurrence
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered (EPBC)	Recorded – Field survey verified the presence of this TEC within the project area.
Grey box-grey gum wet forest of subtropical eastern Australia	Endangered (EPBC)	Low – corresponding regional ecosystems are absent within the project area.
Lowland Rainforest of Subtropical Australia	Critically Endangered (EPBC)	Low – corresponding regional ecosystems are absent within the project area.
Subtropical and Temperate Coastal Saltmarsh	Vulnerable (EPBC)	Low – corresponding regional ecosystems are absent within the project area.
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered (EPBC)	Recorded – Field survey verified the presence of this TEC within the project area.
Swamp Tea-tree (<i>Melaleuca irbyana</i>) Forest of South-east Queensland	Critically Endangered (EPBC)	Low – corresponding regional ecosystems are absent within the project area.
White Box- Yellow Box Blakeley's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered (EPBC)	Low – corresponding regional ecosystems are absent within the project area.
Threatened Flora Species		
<i>Corchorus cunninghamii</i> (Native Jute)	Endangered (EPBC)	Low – suitable habitat within project area, but despite substantial effort during seasonal surveys, the species was not recorded and is not present.
<i>Gossia gonoclada</i> (Angle-stemmed Myrtle)	Endangered (EPBC)	Low - suitable habitat within project area, but despite substantial effort during seasonal surveys, the species was not recorded and is not present.

Ecological Aspect / Name	Conservation Status (Act)	Likelihood of Occurrence
<i>Macadamia integrifolia</i> (Macadamia Nut)	Vulnerable (EPBC)	Low – despite substantial effort during seasonal surveys, the species was not recorded and is not present.
<i>Persicaria elatior</i> (Knotweed)	Vulnerable (EPBC)	Low – Suitable habitat within project area but, despite substantial effort during seasonal surveys, the species was not recorded and is not present.
<i>Rhodomyrtus psidioides</i> (Native guava)	Critically Endangered (EPBC)	Low – suitable habitat within project area and two species records in the surrounding region, but despite substantial effort during seasonal surveys, the species was not recorded and is not present.
Threatened Fauna Species		
Amphibians		
<i>Adelotus brevis</i> (Tusked Frog)	Vulnerable (NC Act)	Moderate Species recorded in the region. Potentially suitable habitat within the project area.
Birds		
<i>Anthochaera phrygia</i> (Regent Honeyeater)	Critically Endangered (EPBC and NC Act)	Low Two species records in region surrounding project area. Suitable foraging habitat potentially present within project area; however, this species typically inhabits areas west of the Great Dividing Range and is unlikely to breed in the region surrounding the project area. Despite a comprehensive survey effort spanning multiple seasons, the species was not recorded within the project area.
<i>Calyptorhynchus lathami lathami</i> (Glossy Black-cockatoo (Eastern))	Vulnerable (EPBC and NC Act)	Moderate Suitable foraging habitat within the project area. Numerous records within 10 km.

Ecological Aspect / Name	Conservation Status (Act)	Likelihood of Occurrence
<i>Monarcha melanopsis</i> (Black-faced Monarch)	Migratory (EPBC) Special Least Concern (NC Act)	Moderate Species recorded in region. Potentially suitable habitat within the project area.
<i>Myiagra cyanoleuca</i> (Satin flycatcher)	(Formerly) Migratory (EPBC) Special Least Concern (NC Act)	Recorded Several individuals recorded within project area
<i>Ninox strenua</i> (Powerful Owl)	Vulnerable (NC Act)	Moderate Species records in the region. Potentially suitable foraging habitat within the project area. Unlikely to be suitable breeding habitat due to the absence of suitable hollows.
<i>Rhipidura rufifrons</i> (Rufous Fantail)	(Formerly) Migratory (EPBC)	Recorded Several individuals recorded within project area
Mammals		
<i>Phascolarctos cinereus</i> (Koala)	Endangered (Queensland, New South Wales, Australian Capital Territory – EPBC)	High Suitable habitat present within the project area. Records within 10 km.
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	Vulnerable (EPBC)	Recorded One individual recorded within the project area.
<i>Tachyglossus aculeatus</i> Short-beaked Echidna	Special Least Concern (NC Act)	Moderate Species recorded in the region. Suitable habitat present within the project area.

Assessment of Project-related Impacts

Table 25 provides a summary of the assumed worst case impact area calculation for each proposed project element.

Table 25 Calculated impact of each component of the ARRC project (refer to Appendix A for layout information)

Facility / Infrastructure	Impact Area (ha)
Material Recovery Facility	4.0
Innovation Park	8.1
Sediment Basins	1.6
Community Education Centre	1.6
Mono Cell Ancillary Infrastructure	1.5
Northern Mono Cell	6.8
Residual WtE Platform	18.1
Internal Roads (including cut and fill areas)	7.2
Southern Mono Cell	4.8
Access Track Clearing Footprint	0.3
Southern Laydown and Ancillary Works Area	13.3
Existing Dam Removal	0.3
Light Vehicle Access Road	0.3
Easement for Utilities Connections	2.4
Total	70.3

Potential Direct Impacts

The project will directly impact 70.3 ha of habitat for a range of native flora and fauna species, as well as a diverse assemblage of common flora and fauna species. The removal of habitat will displace native fauna into adjacent habitats. Important microhabitat features removed because of vegetation clearing, include:

- Groundcover containing hollow logs, coarse woody debris, dense vegetation, and leaf litter suitable for sheltering by reptiles, amphibians and small mammals.
- Hollow bearing trees and stags suitable for shelter and breeding habitat for a range of smaller arboreal fauna such as gliders, possums, hollow nesting parrots, owl nightjars, microbats, and native bees.
- Flowering eucalypts and other native trees providing suitable foraging habitat for fauna such as flying foxes and the koala.

Vegetation clearing works also places some species at risk of direct project-related impacts and potential mortality, including local populations of threatened and/or migratory fauna species. It is possible native fauna could be injured or killed during vegetation clearing, construction activities or vehicle/machinery interactions.

The project will fragment large areas of contiguous habitat currently intact in the project area and surrounds. Fragmentation will increase habitat edges resulting in indirect exacerbation of other impacts including weed and pest animal invasion and noise and light pollution. While the project will increase fragmentation, remaining habitat will continue to provide connectivity corridors for fauna movement throughout the surrounding area. Connectivity to the wider landscape is currently poor due to the highly urbanised landscape and poor corridor continuity surrounding the project area. Sandy Creek is the primary connectivity corridor from the southern end of the project area into the broader landscape and this corridor will be retained.

Despite a comprehensive flora survey effort over six seasonal survey events, no MNES flora species assessed as having a moderate or high likelihood of occurring within the project area were recorded during field surveys and are not at risk of project related impacts.

Table 26 Impact assessment for MNES threatened flora species either recorded or with a moderate or high likelihood of occurrence of occurring in the project area

Species Name (Common Name)	Conservation Status (Act)	Likelihood of Occurrence	Risk of Impact
<i>Corchorus cunninghamii</i> (Native Jute)	Endangered (EPBC)	Low	Species is associated with RE 12.3.11 and RE 12.11.25; however, typically associated with mid elevations (110-430m) which is higher than the elevation at the project. Despite a comprehensive flora survey effort over six seasonal survey events, the species was not recorded and is unlikely to be impacted by the project.
<i>Gossia gonoclada</i> (Angle-stemmed Myrtle)	Endangered (EPBC)	Low	Despite a comprehensive flora survey effort over six seasonal survey events, the species was not recorded and is unlikely to be impacted by the project.
<i>Macadamia integrifolia</i> (Macadamia Nut)	Vulnerable (EPBC)	Low	Despite a comprehensive flora survey effort over six seasonal survey events, the species was not recorded and is unlikely to be impacted by the project.
<i>Persicaria elatior</i> (Tall Knotweed)	Vulnerable (EPBC)	Low	Despite a comprehensive flora survey effort over six seasonal survey events, the species was not recorded and is unlikely to be impacted by the project.

Species Name (Common Name)	Conservation Status (Act)	Likelihood of Occurrence	Risk of Impact
<i>Rhodomyrtus psidioides</i> (Native Guava)	Critically Endangered (EPBC)	Low	Despite a comprehensive flora survey effort over six seasonal survey events, the species was not recorded and is unlikely to be impacted by the project.

A risk of impact assessment has also been completed for MNES and MSES threatened fauna species that were identified in the desktop likelihood of occurrence assessment and updated following field surveys. The assessment is presented in Table 27.

Table 27 Impact assessment for MNES threatened fauna species either recorded or with a moderate or high likelihood of occurrence of occurring in the project area

Species Name (Common Name)	Conservation Status (Act)	Likelihood of Occurrence	Risk of Impact
<i>Anthochaera phrygia</i> (Regent Honeyeater)	Critically Endangered (EPBC)	Low	Two species records in the region around the project area. Suitable foraging habitat potentially present on the project site; however, this species typically inhabits areas west of the Great Dividing Range and is unlikely to breed locally to the project. Despite a comprehensive flora survey effort over six seasonal survey events, the species was not recorded and is unlikely to be impacted by the project.
<i>Calyptorhynchus lathami</i> (South-eastern Glossy Black-Cockatoo)	Vulnerable (EPBC)	Moderate	Suitable foraging habitat available and present in the project area. Approximately 36.6 ha of potentially suitable foraging and roosting habitat will be impacted by the project. Referral to DCCEEW under the EPBC Act.
<i>Phascolarctos cinereus</i> (Koala)	Endangered (EPBC – Qld, NSW & ACT)	Moderate	Suitable habitat present in project area; records within 10km. Approximately 58.9 ha of potential foraging and sheltering habitat for the species will be impacted by the project. Habitat does not support core breeding habitat for the species. Despite a comprehensive flora survey effort over six

Species Name (Common Name)	Conservation Status (Act)	Likelihood of Occurrence	Risk of Impact
			seasonal survey events, the species was not recorded, although some minor scratch marks on one tree with the potential to be associated with the species were observed. The 58.9 ha of impact upon the habitat will lead to an overall reduction of habitat for the species in the region; therefore, the species is at risk of project related impacts. Referral to DCCEEW under the EPBC Act.
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	Vulnerable (EPBC)	Recorded	One individual recorded in the project area. Approximately 58.9 ha of potential foraging and sheltering habitat for the species will be impacted by the project. This habitat does not support a colony of the species and is not breeding habitat. The 58.9 ha of impact will lead to an overall reduction of habitat for the species in the surrounding region; therefore, the species is at risk of project related impacts. Referral to DCCEEW under the EPBC Act.

Environmental Offsets

An assessment of MNES and MSES impacted has been undertaken against the EPBC Act Offsets Policy and the Queensland *Environmental Offsets Act 2014*. This assessment sets out both National and State matters that are expected to be impacted by the project, whether the matter requires offsetting and under which framework (EPBC or EO Act), the area of impact assessed, the offset requirements, and the area of offset required. Advice received from the Department of State Development, Infrastructure and Planning notes that there is no mechanism to deliver offsets either offsite or as financial offsets for designations under the EO Act. It is understood that the expectation is that any required offsets are to either be delivered within the footprint of the designation, or if this is not feasible, a justification is to be provided. The assessment and all relevant information described previously is provided in Table 28. A figure showing MSES Matters is provided in

Table 28 MNES and MSES matters potentially requiring offsets under the EPBC Act Offsets Policy or the EO Act

Matter	MNES Matter	MSES Matter	Area of impact	Offset Requirements under the EO Act	Multiplier	Offset Area required	Availability of land for On-Site Offsets
Koala	Yes	Yes	58.9	Koala habitat is being offset under EPBC Act, and therefore not being assessed or subject to offset under the EO Act	-	-	N/A
South-eastern Glossy-black Cockatoo	Yes	Yes	36.6	South-eastern Glossy-black Cockatoo habitat loss is being offset under EPBC Act, and therefore not being assessed or subject to offset under the EO Act	-	-	N/A
Grey-headed Flying-fox	Yes	Yes	58.9	Grey-headed Flying-fox habitat loss is being offset under EPBC Act, and therefore not being assessed or subject to offset under the EO Act	-	-	N/A
Subtropical Eucalypt Forest and woodland TEC	Yes	No	3.2 (2.0 direct, 1.2 indirect)	Subtropical Eucalypt Forest and woodland TEC is a MNES, and therefore not being assessed or subject to offset under the EO Act	-	-	N/A
Swamp Sclerophyll Forest TEC	Yes	No	1.6 (direct), 0 indirect	Swamp Sclerophyll Forest TEC is MNES, and therefore not being assessed or subject to offset under the EO Act	-	-	N/A

Matter	MNES Matter	MSES Matter	Area of impact	Offset Requirements under the EO Act	Multiplier	Offset Area required	Availability of land for On-Site Offsets
Of Concern RE 12.3.11	Yes	No - RE associated with Subtropical Eucalypt Forest and woodland TEC	0.1	The areas of 'Of Concern RE 12.3.11' have been assessed under the Subtropical Eucalypt Forest and woodland TEC, and therefore not being assessed or offset under the EO Act	-	-	N/A
Of Concern RE 12.3.11b	Yes	No - RE associated with Subtropical Eucalypt Forest and woodland TEC	2.1	The areas of 'Of Concern RE 12.3.11b' have been assessed under the Subtropical Eucalypt Forest and woodland TEC, and therefore not being assessed or offset under the EO Act	-	-	N/A
Of Concern RE 12.11.25	No	Yes	12.4	A significant residual impact was identified for Of Concern RE 12.11.25, and therefore an offset under the EO Act will apply.	4:1	49.6	Insufficient space is available within the Project Area to account for the offsets of 49.6 ha.
Remnant vegetation within the defined distance of a watercourse	No	Yes	0.4	SRIA not identified, and therefore offsets under the EO Act are not required	-	-	N/A
Regulated vegetation intersecting a	No	Yes	1.3	SRIA not identified, and therefore offsets under the EO Act are not required	-	-	N/A

Matter	MNES Matter	MSES Matter	Area of impact	Offset Requirements under the EO Act	Multiplier	Offset Area required	Availability of land for On-Site Offsets
wetland - RE 12.11.25							
Regulated vegetation intersecting a wetland - RE 12.3.11b	No	Yes	0.1	SRIA not identified, and therefore offsets under the EO Act are not required	-	-	N/A
Essential Habitat - Wallum Froglet	No	Yes	1.6	A significant residual impact was identified for Essential Habitat - Wallum Froglet, and therefore an offset under the EO Act will apply.	4:1	6.4	Approx 4.1 ha of retained 12.3.6 is present, which therefore is not sufficient for on-site offsets.
Essential Habitat - Macadamia Nut	No	Yes	20.2	A significant residual impact was identified for Essential Habitat - Macadamia Nut, and therefore an offset under the EO Act will apply.	4:1	80.8	Insufficient space is available within the Project Area to account for the offsets of 80.8 ha.
Connectivity - Cat B Reg V	No	Yes	32.5	This GIS analysis, using the Landscape Fragmentation and Connectivity (LFC) tool, has determined that impacts on connectivity areas are significant, and offsets will be required.	1:1	32.5	Insufficient space is available within the Project Area to account for the offsets of 32.5 ha.

Matter	MNES Matter	MSES Matter	Area of impact	Offset Requirements under the EO Act	Multiplier	Offset Area required	Availability of land for On-Site Offsets
Wetlands of high ecological significance	No	Yes	0.07	SRIA not identified, and therefore offsets under the EO Act are not required	-	-	N/A
NC Act Fauna Species	No	Yes	-	No fauna species listed under the NC Act were identified as having SRIA, and therefore offsets under the EO Act are not required	-	-	N/A
NC Act Flora Species	No	Yes	-	No fauna species listed under the NC Act were identified as having SRIA, and therefore offsets under the EO Act are not required	-	-	N/A
Waterways for waterway barrier works	No	Yes	-	SRIA not identified, and therefore offsets under the EO Act are not required	-	-	N/A

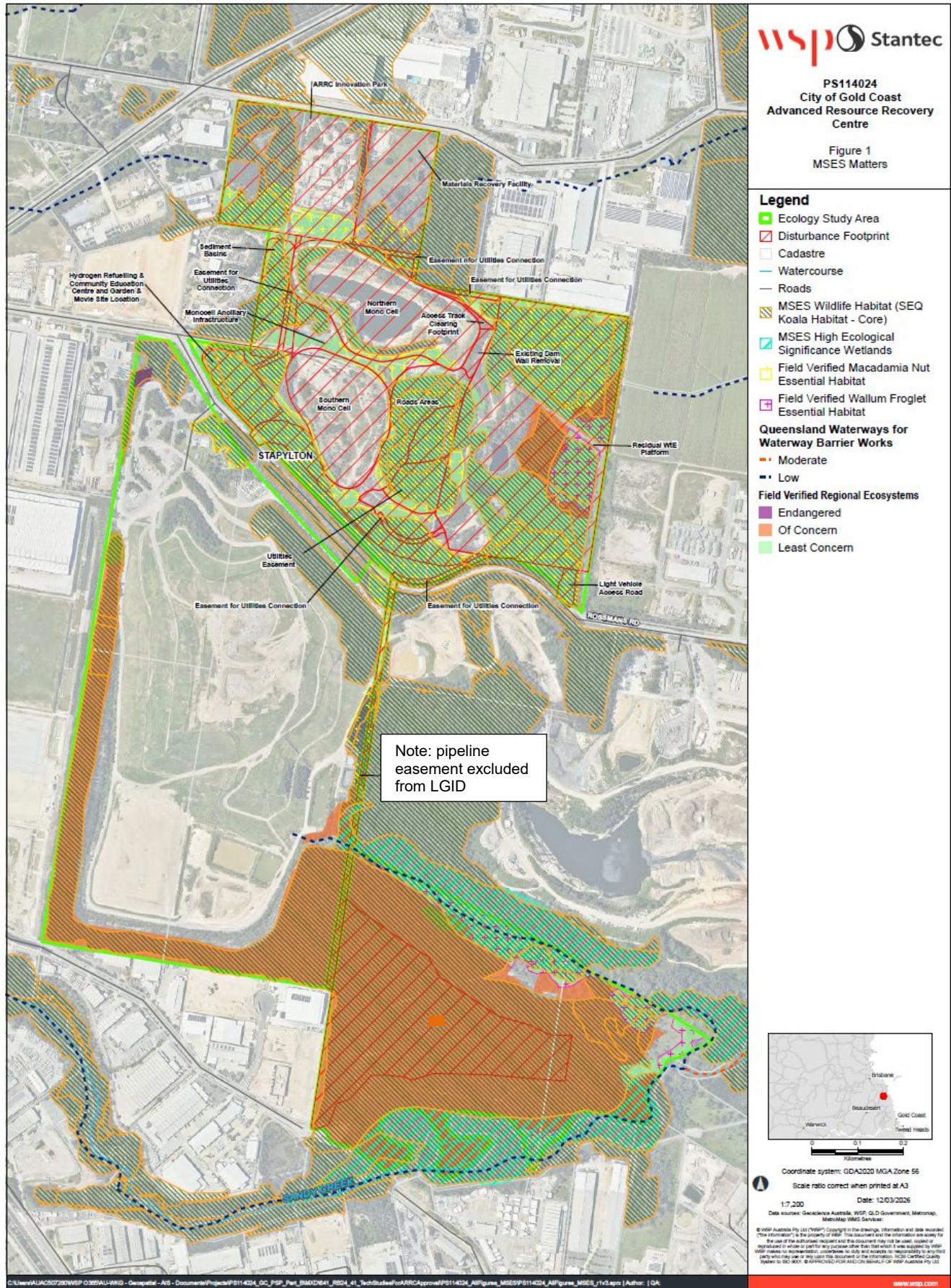


Figure 17 MSES Matters

There were four MSES matters that were identified as requiring offsets under the EO Act that are not covered by the offsets being delivered under the EPBC Act Offsets Policy. These are:

- Of Concern RE 12.11.25: 12.4 ha impacted; EO Act offset ratio 4:1 = 49.6 ha offset requirement
- Essential Habitat – Wallum Froglet: 1.6 ha impacted; EO Act offset ratio 4:1 = 6.4 ha offset requirement
- Essential Habitat – Macadamia Nut: 20.2 ha impacted; EO Act offset ratio 4:1 = 80.8 ha offset requirement
- Connectivity – Category B Regulated Vegetation: 32.5 ha impacted; EO Act offset ratio 1:1 = 32.5 ha offset requirement

Refinements to the impact footprint in the southern precinct as a result of the integration of buffers to TECs as required under the EPBC Act conservation advice have reduced the overall impact footprint by approximately 3 ha and additionally lowered the impact areas of a number of MSES to below the trigger values for offset requirements. However, the four matters listed above that do trigger an offset requirement have been assessed for suitability of offset capacity within the designation footprint. For these matters there is insufficient space within the undeveloped, non-impact area of the designation footprint to accommodate the required offset delivery ratio area. This assessment has been based both on the available area within the footprint that is not disturbed and on the capacity of the environment, land, and hydrology to successfully deliver an offset. There is some capacity within these areas to enhance and improve the existing vegetation and MSES, which can be achieved through a combination of management (weed and pest control, fencing, exclusion, and land management measures) and some small-scale replanting. However, as the space is insufficient for the delivery of the full offset requirement, no formal offsets are proposed for these four MSES matters.

Potential Indirect Impacts

Indirect impacts occur when project-related activities affect vegetation or habitats in a manner other than a direct loss or clearing. Examples of indirect impacts include:

- Bare earth facilitating for the invasion and spread of invasive plants (weeds).
- Promotion of soil erosion and sedimentation of waterways.
- Dust inhibiting plant pollination.
- Increased noise activity within or directly adjacent to sensitive habitat areas.

Removal of shelter and breeding habitat including hollow bearing trees and stags, and hollow logs will result in loss of habitat to resident fauna utilising the project area as part of their home range. These species will be displaced in to surrounding adjacent habitat which can result in localised competition for microhabitat resources.

The project has the potential to create favourable conditions for invasive plant species to invade and/or spread within areas immediately adjacent to ground disturbance, which could potentially lead to an increase of existing invasive plant populations. The highest risk areas are where earthworks are to occur within or adjacent to existing invasive plant populations.

Earthworks will be required during the construction phase, which will create areas of bare ground with the potential to create significant soil erosion and sedimentation risks and water quality impacts, if not properly controlled through management and rehabilitation during the construction phase. The project presents a risk of

soil erosion and sedimentation to the watercourses within the surrounding area, which can lead to turbidity and sedimentation impacts downstream.

Several species of introduced pest animal were recorded, including:

- Cane toad (*Rhinella marina*)
- Common myna (*Acridotheres tristis*)
- Rock dove (*Columba livia*)
- European hare (*Lepus europaeus*)
- Black rat (*Rattus rattus*)
- Red fox (*Vulpes vulpes*)
- Asian house gecko (*Hemidactylus frenatus*)

The project area may also have Fire Ants which, although were not recorded during field surveys, are known to occur in the region.

While the project activities, particularly vegetation clearing, have the potential to disperse pest animal species out of the areas of disturbance across the surrounding landscape, it is highly likely that pest animal species recorded in the project area already occupy habitats in the surrounding area. Therefore, the risk of the project resulting in the establishment of these pest animal species in areas where they are currently absent is low.

Excessive dust generation from construction activities could potentially disrupt the pollination cycle and ability of native plants to reproduce (i.e., fertilisation, germination, revegetation and recolonisation of existing plants). Dust may be generated during vegetation clearing and earthworks, as well as from heavy and light vehicle activity. Noise pollution generated by vehicles, machinery and excavation during the construction phase may deter native fauna from utilising areas immediate surrounding the project. Some species of fauna that are sensitive to extended periods of noise generation may be displaced by immediate noise generated from the construction phase and ongoing operational phase.

4.1.7 Mitigation and Management

The Project design and layout has considered design measures to avoid and minimise impacts to native vegetation/habitats and watercourses, including:

- Avoid, where possible, known significant environmental areas and habitats.
- Options to reduce extent of the project footprint and shifting of design layout to minimise impacts to environmental areas and habitats.
- The application of minimum buffer zones (100 m) either side of watercourses to limit impacts to riparian vegetation and wetlands.

These measures have reduced the overall amount (hectares) of native vegetation and habitats supporting the relevant MNES and MSES to be potentially impacted by the project as much as practically possible and avoids direct and substantially limits any indirect impacts to watercourse. The current design for the project has not been finalised and therefore considers the extent of the maximum project footprint in respect to avoiding and minimising impacts to relevant MNES and MSES, as well as other areas of native vegetation and habitats. Impacts to the Coastal Swamp Sclerophyll Forest TEC are unavoidable as it cannot be located elsewhere in the

area surrounding the project due to landform constraints. However, the patch of this TEC at the southern area of the project site will be fully avoided. Potential project-related impacts to the Subtropical Eucalypt Floodplain Forest and Woodland TEC have been minimised as far as possible by the project design.

Pre-clearance surveys and the presence of fauna spotter-catchers will minimise the risk of fauna mortality during vegetation clearing. The provision of fauna exclusion fencing and no-go zones for construction, will reduce the risk of construction activities or vehicle/machinery interactions resulting in fauna fatalities. Species management plans focused on MNES and MSES fauna species will be prepared for the Project prior to construction commencing to guide fauna spotter-catcher activities. As part of the project-specific Construction Environmental Management Plan (CEMP), a detailed Fauna Management Subplan will be developed and implemented that provides for appropriate mitigation measures to inform the location of fauna exclusion and no-go zone fencing. The project will also seek provide appropriate mitigation measures to minimise this risk of loss of habitat features, such as salvage of hollow logs, large woody debris (log piles), large rocks and boulder piles, and hollow tree limbs to be relocated into adjacent areas of suitable habitat where practicable.

The CEMP to be prepared for the project will provide appropriate mitigation measures to prevent impacts from weeds, pests, erosion and sediment loss, dust, noise, and light impacts. The CEMP inclusions are provided in more detail in Section 4.12

Environmental Offsets

Matters of National Environmental Significance Requirements

Under the EPBC Act, offsets may be required where the project results in a significant impact to a MNES. Significant impact assessments for each MNES were conducted in accordance with the Significant Impact Guideline. The significant impact assessments determined that several of the following MNES will be significantly impacted and are subject to an ongoing referral to DCCEEW under the EPBC Act:

- 1.6 ha of Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland TEC
- 3.2 ha (2.0 ha direct impact and 1.2 ha indirect impact) of Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions TEC
- 58.9 ha of koala habitat
- 58.9 ha of grey-headed flying fox habitat
- 36.6 ha of south-eastern glossy black-cockatoo habitat

An OMP has been developed in accordance with the EPBC OMP guidelines and requirements and is currently under assessment by DCCEEW as part of the referral process. Details on the EPBC, including relevant correspondence and reports, has been provided in Appendix B.

Matters of State Environmental Significance Offset Requirements

An environmental offset condition may be imposed under various State assessment frameworks (such as the Planning Act) for an activity prescribed under the EO Act if the activity will or is likely to have a significant residual impact on a prescribed environmental matter that is a MSES.

The *Queensland Environmental Offsets Policy* states the following regarding matters that are both MNES and MSES:

4.1.8 Summary and Conclusions

The project area contains numerous MNES and MSES that will be impacted by the development of the site for the ARRC. A referral of the project to DCCEEW under the EPBC Act regarding the outcome of the significant impact assessment on MNES returned the decision that the project is considered a 'Controlled Action' and requires further assessment via the preliminary information pathway.

MSES are also expected to be significantly impacted by the project, including a number of matters in addition to MNES that will not be covered under Commonwealth offset conditions. While effort has been made to avoid impacts, through alterations to the design and layout of the ARRC, the imposition of buffer zones to all waterways, and alterations to access roads and circulation, a number of the impacts are unavoidable. Temporary impacts that have the potential to occur during construction will be mitigated through the development and implementation of a CEMP, as described in more detail in Section 4.12 .

4.2 Surface Water and Hydrology

4.2.1 Introduction, Purpose, and Scope

The development of the ARRC will alter the existing surface levels, water permeability, and overland flow paths for stormwater that currently existing on the sites, through the cut and fill of ground to enable construction of each facility, compliant water management on the regulated sites, and the removal of vegetation and paving of hard surfaces. In order to determine the potential impacts of these changes to surface water flows, an assessment of the existing conditions has been performed followed by the development of a preliminary stormwater model that enables scenarios related to the ARRC project configurations to be run. These scenarios were then analysed for the potential impact to surface water and to inform the next stage of the design process for each facility with regard to requirements for stormwater infrastructure, proposed authorised release points, the separate of clean and dirty water, and water treatment where necessary.

4.2.2 Existing Environment

Catchment Overview

The location of the ARRC Precinct on a ridge line limits any significant upstream catchments from entering the site. Table 35 summarises the catchment sizes, both internal and external, for each area of the ARRC precinct. No areas have a significant upstream catchment. The residual WtE has the largest external catchment which is proportionally one quarter of the total site area. All external catchments can be managed with appropriate stormwater infrastructure.

Table 29 ARRC facility area catchment sizes

Component	Area (ha)		
	External	Internal	Total
Innovation Park	4.2	4.1	8.3
Community Education Centre and Hydrogen Refuelling Station	1.7	1.9	3.6
Mono Cells	0	12.8	12.8
MRF	3.5	7.7	11.2
	0	34.3	34.3
Residual WtE	5.4	21.1	26.5

The north-eastern portion of the northern precinct drains east into adjacent industrial and agricultural land, where it enters existing cane drains, before flowing into the Woongoolba floodplain. Only the north-western lot (4RP110743) drains west into the Albert River, via a drainage line. The southern portion of the northern precinct discharges in a southerly direction eventually discharging through the City's Stapylton Landfill and Sandy Creek.

The northern precinct site currently is a combination of undisturbed vegetation, quarrying and access tracks. There are two legacy quarry voids on the site, in the centre and on the southern boundary. The site includes a

sediment dam on the south-eastern corner. This was likely used to capture sediment laden runoff from previous quarrying activities. The site also contains small dams on the northern vacant lots, these are likely farm dams associated with previous land uses. The southern precinct contains no permanent water bodies or dams, with an unnamed tributary of Sandy Creek forming the northern boundary of the site, and Sandy Creek the southern boundary.

The topography, geology, and climatic conditions of the site and surrounding regional area is discussed in more detail in Section 4.4.2

Local Drainage

The ARRC is located on a saddle ridgeline and, as such, the precinct has many different stormwater discharge locations to surrounding properties. For the purposes of discussing stormwater matters, the precinct has been separated into the 'northern precinct', comprising the MRF, Innovation Park, residual WtE facility, mono cells, hydrogen refuelling station, and the Community Education Centre, and the southern precinct, consisting of a laydown area and ancillary works area for the waste management precinct. The stormwater discharge locations for the northern precinct have been labelled A to F in Figure 18 and Figure 19 for the southern precinct.

The western portion of the Innovation Park precinct on lot 4RP110743 has an existing drainage dam which has been mapped in State mapping and is also visible in available topographical data. The dam is relatively small and is not anticipated to fundamentally alter run-off characteristics. The site is presently vegetated, and the topography includes a well-defined gully which is a mapped watercourse. Stormwater runoff discharges in a westerly direction to the downstream property Lot 3 on RP110743. The downstream site does not include an easement, but there is a State mapped watercourse. This area also receives stormwater runoff from a development site to the north (2WD4654), noting that available topographical data does not appear to reflect the final proposed landform for this site. The watercourse that passes through this precinct also passes through two downstream properties, each with one or more road crossings of the watercourse (with culverts) before it passes beneath Stapylton – Jacobs Well Road, Yellowwood Road and ultimately discharges into the Albert River.

The eastern side of the Innovation Park (lot 5RP110743) and the MRF (6RP110743) is predominantly clear of vegetation, with the exception of the southern half of 6RP110743, which is densely vegetation with trees. There is a small dam on the central eastern boundary of 6RP110743, which discharges in an easterly direction to the downstream property Lot 9 on RP184832. The property immediately downstream is densely vegetated and has a small dam on the eastern boundary of the lot. Stormwater discharge to the east is to a shallow, but well-defined, gully feature that is not a mapped watercourse. Further downstream, all runoff enters a constructed open channel drainage system on the southern side of Quinns Hill Road East. This open channel has been constructed as part of an industrial development to replace a mapped watercourse. Properties on the southern side of Quinns Hill Road East include culvert crossings to traverse the open channel. Ultimately, this stormwater runoff enters the wider Woongoolba Floodplain to the east of the ARRC.

Stormwater runoff from the eastern part of the residual WtE precinct and mono cells (1 and 2 SP171268) presently discharges across the eastern site boundary to private property. The total catchment area to this boundary is approximately 24.5 ha and consists of well vegetated sloping ground. Note that the former quarry pit that has been converted to a recycled water storage lagoon does not contribute stormwater runoff to the

eastern boundary, which has been the case for several years. The 6.7 ha catchment associated with the storage lagoon is effectively a sink, with inflows and outflows managed via pumping and pipes. The receiving environment for the eastern stormwater discharge location consists of private property, being Lot 150 on W31134. This lot is being used for multiple purposes, with a recently approved industrial usage on the southern portion of the site. The industrial area has been filled to above the regional defined flood event (DFE) level. A stormwater management plan and implemented infrastructure has been approved by the City's Development branch and is in place on site. The remainder of the lot (and those further east) appears to be used primarily for cropping. The cropping land use may be sensitive to changes in stormwater discharge characteristics. There is an easement located 200m north of the drain which extends to the site boundary and includes a mapped 'canal line' for much of the length.

The remainder of 1SP171268 is partially vegetated with some sealed and unsealed access tracks traversing the catchment. The western side of the lot discharges in a westerly direction to the downstream property Lot 9 on RP1110743. The property immediately downstream has been mostly cleared for an industrial unsealed hardstand. The southeast corner of the lot is densely vegetated. Stormwater discharges to this undeveloped part of the lot where there is a well-defined gully feature that is a City-mapped watercourse. Further downstream, all runoff discharges under Quarry Road and re-enters the ARRC precinct (2SP171268) in the vicinity of the proposed Community Education Centre.

The southwest portion of 2SP171268, near the proposed Community Education Centre, is vegetated upstream with stormwater discharging in a westerly direction under Rossmanns Road via a culvert to the downstream property Lot 2 on RP209307 (the City owned Staplyton Landfill). Further downstream, all runoff discharges into the northern clean water diversion channel of the Staplyton Landfill. This channel discharges into an unnamed tributary of Sandy Creek.

The southern portion of 2SP171268 contains a former quarry void (southern mono cell) along with some unsealed access tracks traversing the catchment. There are some locations with concentrated discharges which are associated with drainage from the former quarry void. Stormwater discharges in a westerly direction to the roadside drainage channel on the northern side of Rossmanns Road. Stormwater runoff flowing in this channel discharges in a southerly direction under Rossmanns Road via a culvert. Further downstream, all runoff discharges into the northern clean water diversion channel of the Staplyton Landfill. This channel discharges into an unnamed tributary of Sandy Creek.

The entirety of the southern precinct directly discharges to Sandy Creek to the south, and the unnamed tributary of Sandy Creek to the north. There are no sensitive receptors or infrastructure noted within the immediate vicinity of the stormwater discharge locations.

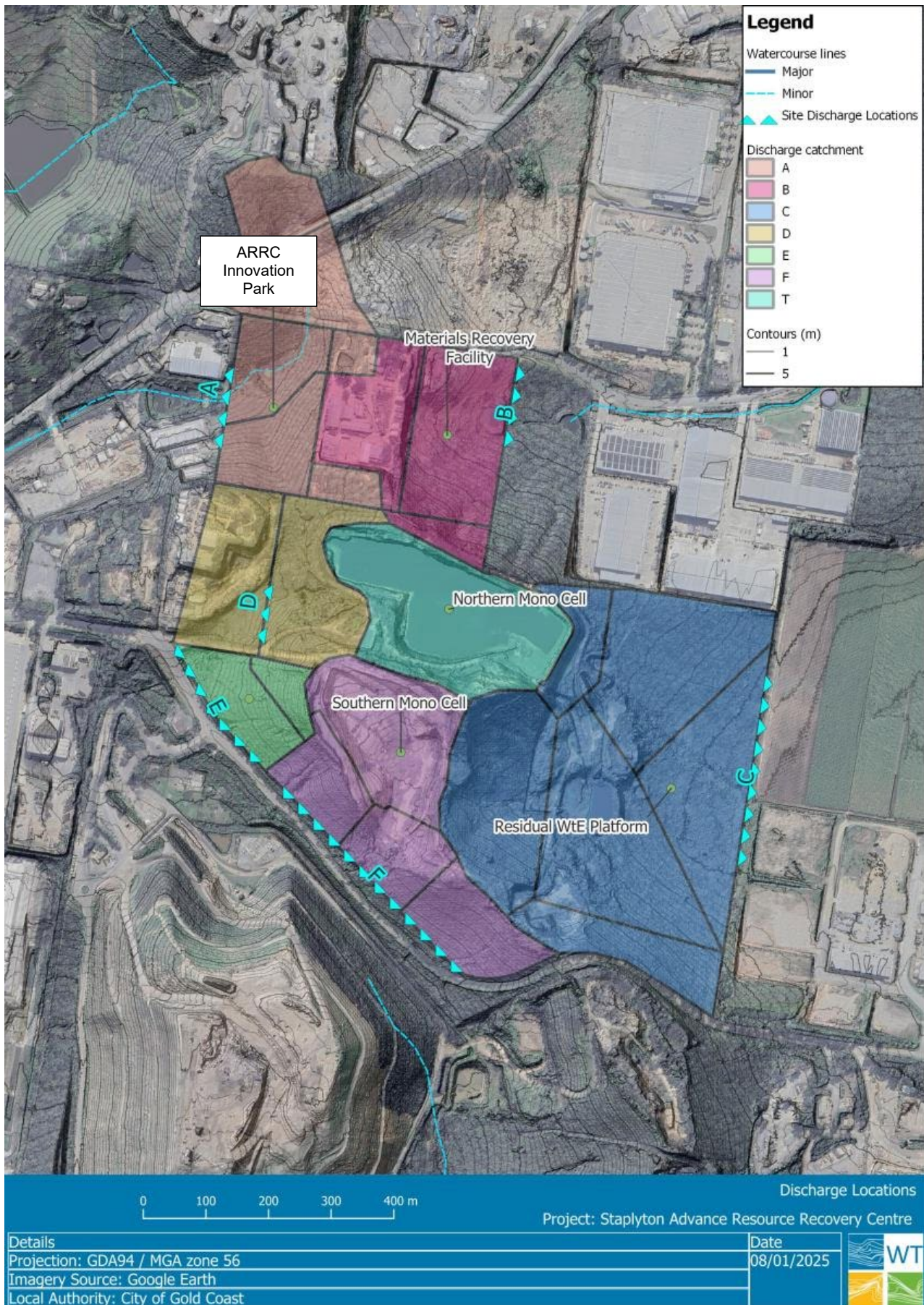


Figure 18 Existing stormwater discharge locations for the northern precincts.

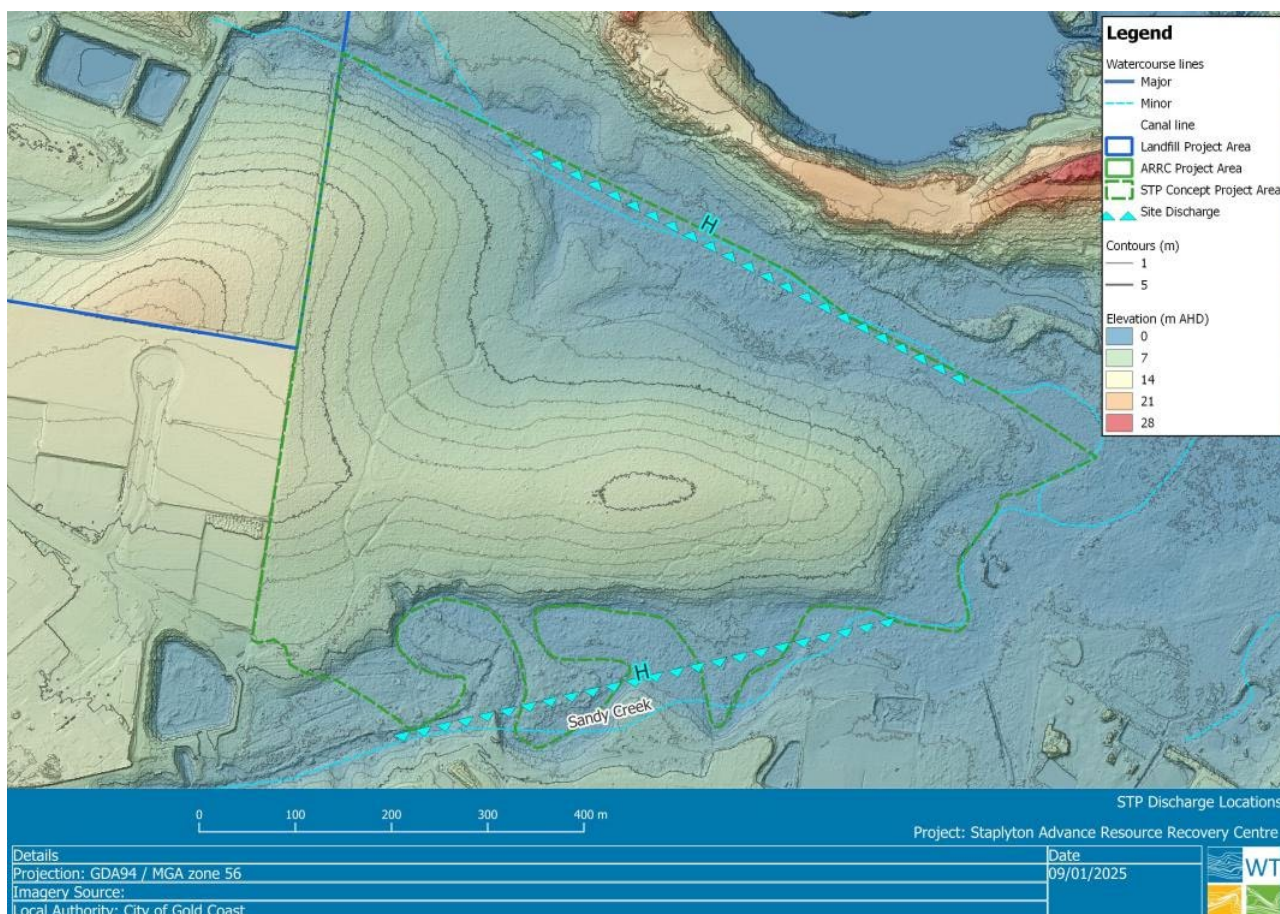


Figure 19 Existing stormwater discharge locations for the southern precinct.

Environmental Values and Water Quality Objectives

The Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water and Wetlands), which is subordinate legislation to the *Environmental Protection Act 1994*, provides a framework for identifying environmental values (EV) for a waterway and associated water quality objectives (WQO) to protect or enhance those EVs. EVs for water are the qualities of water that make it suitable for supporting aquatic ecosystems and human water uses. These EVs need to be protected from the effects of habitat alteration, wastewater releases, contaminated runoff and changed flow to ensure healthy aquatic ecosystems and waterways that are safe for community use.

Some run-off from the ARRC discharges through Sandy Creek or the Logan and Albert Rivers and eventually discharges into Moreton Bay, which is home to a range of environmentally significant and protected species. As per EPP Water and Wetlands, the site corresponds with Basin 145 in the Logan-Albert River basin. It is understood that the Staplyton Landfill Environmental Authority (EA) takes the prescribed water quality constraints of the site into consideration. Note that the receiving environment for the Staplyton Landfill facility EA specified discharge locations fall under “Moderately Disturbed” management intent (level of protection). The ARRC precinct is expected to discharge to similar locations as specified in the Staplyton Landfill EA along with some additional locations at the northern end of the site to the Logan and Albert Rivers.

4.2.3 Stormwater Modelling Approach and Methodology

Overview

A site-specific hydrological assessment has been undertaken using WBNM (Version 2003_V103) non-linear runoff routing program developed by the University of Wollongong to:

- Characterise existing stormwater discharge characteristics with respect to peak stormwater run-off
- Assess the potential for the ARRC precinct to result in increases to stormwater runoff
- Prepare concept designs for mitigation measures

The preliminary assessment has utilised the ARR87 hydrological methodology as it defines a single design storm per design event per duration, as opposed to 10 design storms. While the design is undergoing frequent refinement, the adoption of the simplified hydrological methodology is considered appropriate and fit-for-purpose. The hydrological methodology can be updated to ARR19 as part of subsequent design stages and refinement of the developed scenario sub-catchment delineation if required.

The following sections of this report provide details of site-specific stormwater discharge assessments.

Catchments

Existing scenario sub-catchment delineations and current design ultimate sub-catchment delineations prepared for the WBNM model for the site and external catchment areas are illustrated in Figure 20.

With respect to the assumed fraction impervious values, these have been estimated based on a review of aerial imagery. Within the site for the existing scenario, a fraction impervious of 0% was adopted for bushland, 10% where access tracks or hardstands were observed, and 50% for the existing floor of the former quarry area (representative of the partially exposed rock surfacing). Future pad areas forming the facilities/access roads within the ARRC precinct have adopted 90 per cent fraction impervious. The following notes are made with respect to sub-catchment delineation:

- Sub-catchments A010 and A020 have been assumed to be undeveloped in line with the QLD Globe imagery and the City topographic data. More recent aerial imagery suggests that development has occurred in these areas. Providing that development has implemented peak discharge mitigation measures, adoption of undeveloped conditions is appropriate for this assessment.
- Sub-catchment T010 in the existing scenario is a terminal catchment and does not contribute stormwater runoff across any of the site boundaries. This area consists of a large, recycled water storage dam in a former quarry pit. It is understood that water levels in the dam are controlled via balancing pumping in of recycled water and pumping out of recycled water for industrial and irrigation uses.
- Post-development sub-catchments associated with the two mono cells are based on the ultimate capped landform and proposed stormwater management for erosion and sediment control purposes. This analysis has not considered staging of works associated with the mono cells and potential interim arrangements.
- In the developed scenario, sub-catchments external to the proposed pad areas have been assumed to be diverted around the pads via diversion drains, pipes or other infrastructure. This has been represented in the WBNM model by routing runoff from upslope catchments directly to site discharge location. This allows

for subsequent detention basin sizing to exclude these catchment areas from detention but still account for this runoff in establishing peak discharge non-worsening conditions at the site boundary.



Figure 20 Existing Sub-Catchment Delineation

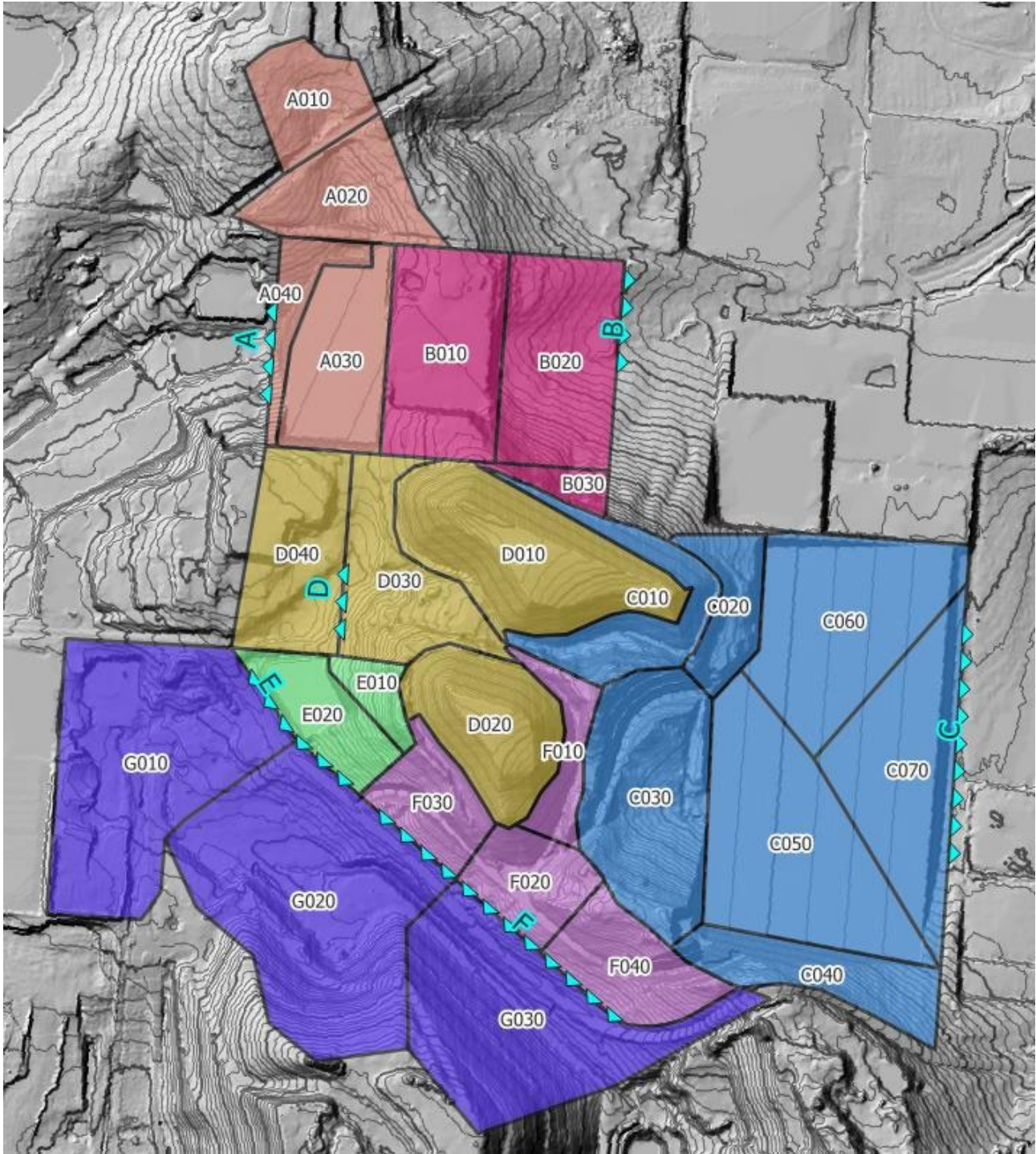


Figure 21 Post-Development Sub-Catchments

WBNM Model Parameters and Validation

Details regarding additional hydrological modelling parameters are summarised below:

- Rainfall losses were adopted from the City's Woongoolba Hydraulic Study dated November 2013, which included the Pimpama River catchment and Logan River catchment. The study was calibrated across many historical flood events and adopted an initial loss of 10mm and a continuing loss of 1.2mm/hr.
- Intensity-Frequency-Duration (IFD) parameters were adopted for this site as per Southport as generated by the BoM as outlined in AR&R (1987).
- A catchment lag parameter of 1.6 was adopted in the WBNM model for the pervious portion of the catchment and 0.1 for the impervious catchment portion. These parameters represent standard values in accordance with WBNM model guidelines.

Being a site-specific investigation of an ungauged local catchment, there is no site-based data to calibrate runoff. Accordingly, the WBNM hydrologic model has been validated using the Rational Method as per guidelines in the Queensland Urban Drainage Manual (QUDM, 2016). Validation was undertaken for the existing scenario catchment to the southern extent of the model.

WBNM results for all design events are within 7 per cent of Rational Method flow estimates. Therefore, the WBNM model was adopted for characterising peak discharge from the site and subsequent detention basin design.

4.2.4 Hydrological Model Results – Peak Discharge

Hydrological models were used to estimate peak discharge from the site for both existing and developed (unmitigated) scenarios to establish the baseline conditions and whether stormwater mitigation infrastructure will be required to achieve non-worsening in peak stormwater discharge.

Peak flow summaries have been presented and discussed in the following sections.

Discharge Location A – North West (Innovation Park)

The results indicated that there would be no fundamental change in peak discharges across the site boundary at Location A, with post-development flows within 5 per cent of pre-development. This is due to the slight reduction in total catchment area, which is assumed to be occurring associated with development of the adjacent sub-catchment to the east (B010) and the location of the proposed pad immediately adjacent to the outlet of the local catchment. Onsite detention can be implemented within the western portion of the ARRC Innovation Park to manage the residual increases in peak discharge, however this is not considered necessary to achieve a fundamental non-worsening in stormwater conditions at the downstream site boundary.

Discharge Location B – MRF Precinct Area

The results indicate that there would be a significant increase in peak discharges across the site boundary at Location B unless mitigation measures are implemented. The increase in peak discharge is primarily due to the creation of the large hardstand areas associated with the MRF and ARRC Innovation Park and the slight increase in total catchment area that will also occur. Detention can be implemented close to the downstream site boundary to mitigate peak discharge increases.

Discharge Location C – Eastern Boundary (Residual WtE Facility)

The results indicate that there would be a significant increase in peak discharges across the site boundary at Location C unless mitigation measures are implemented. The increase in peak discharge is primarily due to the creation of the large hardstand areas associated with the residual WtE facility and the slight increase in total catchment area that will also occur.

The analysis has not considered the potential interim situation before construction of the northern mono cell whereby the existing dam is decommissioned, and the former quarry void becomes free-draining towards the east (as represented by sub-catchment T010).

Discharge Location D – Western Boundary (Northern Precinct)

The results **Error! Reference source not found.** indicate that there would be a significant increase in peak discharges across the site boundary at Location D unless mitigation measures are implemented. The increase in peak discharge is due entirely to the total increase in catchment area draining to this area, which is associated with the stormwater management of both mono cells. This has not considered the potential staging of works associated with the mono cells, nor the potential to progressively direct runoff from the southern mono cell to the south-west through sub-catchment F030.

Discharge Location E – Community Education Centre

The results indicate that there would be a moderate increase in peak discharges across the site boundary at Location E unless mitigation measures are implemented. The increase in peak discharge is primarily due to creation of the large hardstand areas associated with the Community Education Centre. Detention can be implemented close to the downstream site boundary to mitigate increases in peak discharge.

Discharge Location F – Southern Boundary (southern mono cell)

The results indicate a general reduction in peak discharges across the south-western site boundary. This is due to the reduction in catchment area, with the former quarry void being developed as a mono cell with the majority of stormwater runoff directed to the north-west.

There is no requirement for peak discharge management at Location F. There is sufficient reduction in flows that there could be potential to increase the total catchment area to Location F in future revisions of the site design without any flow mitigation infrastructure being required.

Total Flow in Southern Channel

The WBNM model includes the catchment area to the constructed channel immediately to the south-west of the northern precinct, which is associated with the Staplyton Landfill. Peak discharge results indicate that even in the absence of any peak flow mitigation measures within the south-western portion of the northern precinct, there would be no increase in overall peak flows immediately downstream of the site.

This is due largely to the limited increase in impervious surfaces in this catchment. There is also an effective increase in the overall flow path length with the re-direction of stormwater from the south to the west associated with the development of the northern mono cell.

Onsite Detention – Concept Designs

Conceptual sizing of detention basins for the ARRC northern precinct has been undertaken using the WBNM models. The hydrological assessment for detention basin sizing has considered a range of storm durations from 15 minutes to 6 hours for the purposes of determining critical storm duration and to ensure that the offsite pre-developed flows are not exceeded following inclusion of the basins.

All detention basins have been based on the following geometry considerations:

- 1 in 4 internal batter slopes.
- Allowance for a 1% cross-fall on the basin base.
- Inclusion of a primary outlet (pipe).
- Inclusion of an emergency spillway.

The primary outlet and emergency spillway have been sized to achieve a fundamental non-worsening in peak flows at the respective downstream site boundary. The parameters are conceptual only, and have not been extensively optimised, considered blockage allowances, severe storm blockage etc. These aspects can readily be addressed at a later design stage when greater certainty of the internal site sub-catchment delineation is known - including consideration of staging of works.

This analysis has considered conceptual detention basin designs servicing local stormwater runoff from hardstand areas as follows:

- A030 (western half of the ARRC Innovation Park)
- B020 (eastern half of the ARRC Innovation Park and the MRF)
- C070 (residual WtE)
- E020 (Hydrogen Refuelling and Community Education Centre).

The analysis has also considered a conceptual design for a detention basin servicing stormwater runoff from the majority of the mono cells and mono cell ancillary infrastructure area in sub-catchment D030, noting that this may not be required due to the retention volume to be provided within the erosion and sediment control system(s).

A030 Detention and Location A Non-Worsening

Hydrological analysis indicated only a marginal increase in peak discharge of Location A, even in the absence of onsite detention. A conceptual detention basin has been sized to provide attenuation of runoff from the western portion of the ARRC Innovation Park to mitigate the increases in peak discharge, noting that this basin has not been sized as an 'online' basin with respect to the upslope catchment to the north.

The concept basin results indicate that non-worsening can be achieved at the downstream site boundary across a range of design events.

B020 Detention and Location B Non-Worsening

A conceptual detention basin has been sized to provide attenuation of runoff from the eastern portion of the ARRC Innovation Park and MRF to mitigate the increases in peak discharge at the downstream site boundary. The conceptual basin results indicate that non-worsening can be achieved at the downstream site boundary across a range of design events. The residual increase in the 63 per cent annual exceedance probability (AEP) event is not considered to be an issue at the conceptual design stage, with further refinement of the basin outlet and attenuation performance to be completed as part of a subsequent design stage.

C070 Detention and Location C Non-Worsening

A conceptual detention basin has been sized to provide attenuation of runoff from the residual WtE facility, noting that the upslope catchment is assumed to be diverted around/under the facility (and bypass the detention basin). The basin has been designed to mitigate peak flows at the downstream site boundary even considering the small upstream catchment discharge. The conceptual basin results indicate that non-worsening can be achieved at the downstream site boundary across a range of design events.

D030 Detention and Location D Non-Worsening

A conceptual detention basin has been sized to provide attenuation of runoff from the area around the mono cells, noting that the increase in runoff is not due to an increase in impervious surfacing but the assumed catchment diversions associated with the ultimate mono cell landforms and erosion and sediment control systems. The basin has been designed to mitigate peak flows at the downstream site boundary.

The conceptual basin results indicate that non-worsening can be achieved at the downstream site boundary across a range of design events, noting that further refinement of the basin outlet could be undertaken as part of a subsequent design stage to refine the performance in the 63 per cent AEP event. It is noted that the calculated detention volume of almost 7ML is significantly less than the approximately 18ML required as part of proposed erosion and sediment control systems. Provision of the sediment basins, as documented, should negate the need to provide any onsite detention at D030. Further, on stabilisation of the final mono cell landforms, there may be potential to direct stormwater runoff from part or all of the southern mono cell discharge location F. This would substantially reduce the catchment area to Location D, with Location F otherwise already showing a substantial reduction in peak flows in the developed case.

E020 Detention and Location E Non-Worsening

A conceptual detention basin has been sized to provide attenuation of runoff from the Hydrogen Refuelling & Community Education Centre, noting that the upslope catchment is assumed to be diverted around the platform (and bypass the detention basin). The basin has been designed to mitigate peak flows at the downstream site boundary even considering the small upstream catchment discharge.

The conceptual basin results indicate that non-worsening can be achieved at the downstream site boundary across a range of design events, noting that further refinement of the basin outlet could be undertaken as part of a subsequent design stage to refine the performance in the 63% AEP event.

Peak Discharge Mitigation Strategy Discussion

Without the inclusion of detention and controls, the development of the ARRC northern precinct could have the potential to impact peak stormwater discharges from existing stormwater discharge locations. The addition of hardstand areas and roadways will reduce the potential for infiltration and increase surface run-off. Inclusion of detention basins within the sub-catchments A030, B020, C070 and E020, associated with the various ARRC facility hard stands, will manage peak stormwater discharges from these catchments.

A detention basin has also been nominated for sub-catchment D030 to manage peak flows to the downstream private property. The need for this detention basin will be confirmed at a later design stage when further details regarding staging of the mono cells is known, and associated erosion and sediment control dam sizing has been confirmed. It is considered likely that provision of appropriately sized erosion and sediment control dams within this catchment will provide sufficient capacity to manage peak discharge at this location.

This analysis has demonstrated that the conceptual detention strategy can achieve non-worsening in peak discharges at all stormwater discharge locations from the ultimate landform of the northern precinct. Due to discharge to the regional waterway systems rather than private property, the southern precinct is not considered to require peak discharge mitigation. Note that this assessment has only considered peak discharges, and has not included an assessment volumetric, timing and duration aspects of stormwater discharge.

4.2.5 Stormwater Pollutant Load Modelling Results

Certain facilities within the ARRC will be subject to ensuring activities on site do not have an impact on the surrounding, receiving environment and required to meet the pollutant load reduction targets specified by DETSI and in the SPP. Specific areas may have additional targets depending on the activities being undertaken, such as workshops, refuelling areas and washdown areas, which will be subject to EA conditions for managing stormwater and water quality impacts from Environmentally Relevant Activities (ERAs).

Water Sensitive Urban Design (WSUD) measures are integrated onsite and represent the long-term infrastructure proposed for the operational phase of the development. The strategy at this stage does not include rainwater tanks or stormwater harvesting. These measures can have a positive impact on the quality of stormwater discharges depending on how the water is used and discharged. The WQOs for activities involving large, disturbed areas are generally associated with management of sediments and total suspended solids through the use of sediment basins.

Water Quality Pollutants

Pollutants assumed to be representative of those found in the proposed industrial and commercial development are as follows:

- Gross pollutants: litter, such as food, drink, and materials packaging and wrappers, leaf matter and grass clippings.
- Sediment: brought in by vehicles, erosion, atmospheric deposition, organic matter, spills and accidents.
- Nutrients: fertilisers, decaying organic matter, animal faeces, detergents, atmospheric deposition.
- Hydrocarbons: fuel and oil spills from cars and trucks, asphalt pavements.

Stormwater treatment devices will be designed to remove these pollutants from stormwater runoff.

Water Quality Standards and Guidelines

Standards and guidelines referenced for the Model of Urban Stormwater Improvement Conceptualisation (MUSIC) analysis are listed below:

- “State Planning Policy” (SPP), Department of State Development, Manufacturing, Infrastructure and Planning, July 2017.
- ESR/2015/1653 Stormwater Guideline for Environmentally Relevant Activities, DETSI
- “Urban Stormwater Quality Planning Guidelines”, Department of Environment and Resource Management, 2009.
- “MUSIC Modelling Guidelines – Version 1.0 – 2010” produced under the Water by Design Program by the South East Queensland Healthy Waterways Partnership 2010.
- “Urban Stormwater – Queensland best practice environmental management guidelines – Technical Note: Derivation of Design Objectives”, Environmental Protection Agency, January 2009.
- “Urban Stormwater Quality Planning Guidelines 2010” Department of Heritage Protection, 2010.

Stormwater quality pollutant load reduction requirements are specified in Water Quality Appendix 2 of the SPP. These reduction targets are calculated as reductions in total pollutant load to be achieved as compared to the theoretical runoff of untreated stormwater from the proposed development.

Hydrocarbons are not a listed pollutant in the stormwater management design objectives and are not a modelled pollutant in MUSIC. Management of specialised work areas with a high risk of hydrocarbon spillage is recommended to be assessed on a case-by-case basis. Identified work areas are to have a tailored risk assessment and management plan that addresses spill collection and capture of stormwater runoff and are not within the scope of this assessment.

MUSIC Model Setup

A MUSIC V6.4 model has been utilised to predict performance characteristics of the proposed stormwater treatment train. MUSIC modelling parameters have been obtained from recommendations specified in the document “Draft MUSIC Modelling Guidelines (V3) – 2018” by Healthy Land and Water. The model and layout demonstrate feasibility and provide an indication of the sizing and quantity of treatment required to achieve design objectives.

Catchment Areas

Catchment boundaries used in the MUSIC modelling are summarised in Table 30. Operational pad areas only were modelled (except for roads). Catchment areas and land use types as applied in the MUSIC modelling are based on the Master Plan shown in Appendix A. External areas to pads are assumed to be diverted around and are excluded from the MUSIC model. Appropriate stormwater management practices need to be employed to the external catchment runoff, but their management is out of the scope of this report at this stage. Most catchment areas are confined to the one disturbance area, except for the Innovation Park and the MRF.

Table 30 MUSIC Model Areas

Land Use Area	MUSIC Category	Area (ha)	Fraction Impervious (%)
Residual WTE facility	Industrial	16.00	95%
Innovation Park	Industrial	2.60	95%
Materials Recovery Facility	Industrial	8.10	95%
Hydrogen facility and Community Education Centre	Industrial	0.60	95%
Road – West	Industrial Road	0.57	75%
Road – East	Industrial Road	1.41	75%
Road – South	Industrial Road	0.46	75%
Road – Central	Industrial Road	0.87	75%

Catchment Impervious Fraction

Typical surface-type splits were applied to the catchments for industrial areas as per the Healthy Land and Water MUSIC modelling guidelines (V3, 2018). These are:

- Road – 30%
- Roof – 50%
- Ground – 20%

Industrial areas are recommended to have a range of 70-95% impervious fraction. For the purpose of conceptual design, impervious fractions for the pads have been modelled in MUSIC with a 95% impervious fraction. This model focuses on the pads only, and not the whole site. Note, the road surface and ground level impervious fractions have been increased from guideline values to achieve a 95% impervious fraction:

- Roof – 100%
- Road Surface – 90%
- Ground Level – 90%

Other Parameters

As recommended in the MUSIC Modelling Guidelines, a "Split Catchment" pollutant export parameter set has been adopted for the MUSIC analysis.

Rainfall and evapotranspiration data were sourced from the BOM for Gold Coast North, retrieved through MUSIC Link with 6-minute rainfall data resolution, as recommended by the MUSIC Modelling Guidelines.

Treatment Layout and Processes

Treatment trains were developed for each catchment identified using best practice management and suitable technologies for the situation. Due to the early stage of design, limited drainage layout information is available. The following treatment methods were used in the assessment:

- Gross Pollutant Trap (GPT): Atlan 'Vortceptor' is a non-blocking hydrodynamic separator that has a screen and treatment action producing low vortex conditions resulting in pollutant removal. It separates and captures gross pollutants, sediments, silt, total suspended solids, some nutrients and oil and grease. The Vortceptor GPT is installed underground with maintenance access from a manhole cover. Refer to manufacturer's website for further information.
- Bioretention: Biological filtration consisting of high permeability filtration media supporting vegetation capable of metabolising dissolved and particulate nutrients. A sediment forebay is designed to remove larger sediment, whilst finer sediment is captured in the filtration media. Bioretention is used in addition to the GPT to remove dissolved nutrients.
- Swale: A longitudinal drain that is often incorporated along the side of roads to capture sediment, allow infiltration and uptake of nutrient in vegetation.

Detention systems will be incorporated into the drainage system following GPTs for the commercial/industrial areas (excluding roads). Detention will not be modelled in MUSIC at this stage due to limited information at the conceptual design phase. On this basis the MUSIC analysis may underestimate the overall system treatment capacity compared to manufacturers specifications. Detention will be modelled in MUSIC in the detailed design stage.

For all areas excluding roads a treatment train to primarily capture gross pollutants, sediment and hydrocarbons is proposed. One central unit is recommended per area to streamline maintenance and reduce movement of vehicles through the sites. The units are recommended to be installed offline and upstream of detention systems. The configuration of these activities will be further refined in later design stages.

Bioretention systems are recommended to remove dissolved nitrogen prior to discharging from site. As a general rule to assist with sizing, bioretention systems require approximately 1.5% of the catchment area for filter media to achieve pollutant reduction targets. This does not include batters or maintenance access, so depending on the batter slopes and access needs, approximately 3-5% of the catchment area may be needed for bioretention treatment in total. Bioretention systems will be installed downstream of detention systems.

Alternatively, underground stormwater treatment facilities could be used if space requirements do not permit above ground systems. A treatment train that consists of a GPT such as a CDS unit and tertiary filters is shown

below. The cost to maintain these devices will be higher, requiring the periodic replacement of cartridges, causing additional costs and waste. Product redundancy over a 50-year life span is also a concern for specialised filters, and hence these are not the preferred option. This option can be investigated if needed during future design phases.

The treatment train process for the access roads leading to the internal areas labelled (Roads – West, Central, South and West) is recommended to use a combination of roadside swales and bio-retention measures. Swales are recommended along both sides of the road, assuming a two-way cross fall. Bioretention is required to remove excessive nitrogen from the stormwater.

Model Results

The MUSIC results demonstrate that the pollutant load reduction objectives for the Site can be achieved using the proposed water quality treatment system. Summaries of MUSIC model results are provided in Table 31 and Table 32.

Table 31 MUSIC results summary – facilities

Parameter	Required Load Reduction	Residual WtE	ARRC Innovation Park	MRF	Hydrogen Facility and Community Education Centre
Total Suspended Solids (TSS)	80%	91%	92%	92%	98%
Total Phosphorus (TP)	60%	62%	63%	63%	70%
Total Nitrogen (TN)	45%	46%	49%	48%	46%
Gross Pollutants (GP)	95%	95%	95%	95%	95%

Table 32 MUSIC results summary - roads

Parameter	Required Load Reduction	Road – West	Road – Central	Road – South	Road - East
Total Suspended Solids (TSS)	80%	96%	97%	97%	96%

Parameter	Required Load Reduction	Road – West	Road – Central	Road – South	Road - East
Total Phosphorus (TP)	60%	82%	84%	84%	81%
Total Nitrogen (TN)	45%	46%	50%	48%	46%
Gross Pollutants (GP)	95%	95%	95%	95%	95%

4.2.6 Stormwater Quality Review and Mitigation – Mono cells

Surface Water Management Objectives

Best practice management of stormwater at landfills, such as mono cells, must comply with the DETSI ESR/2015/1653 Stormwater Guideline for Environmentally Relevant Activities, and involves the separation of different types of surface waters such that each type can be managed appropriately based on its level of risk.

- **Clean Water:**
 - Upstream run-on, for which the activities of the site have not impacted the quality of the water as this runoff has not been generated on the site. This water should be diverted around areas of activity on the site, whilst conveying a suitable capacity of flow and not increasing the flood risk or flow volumes significantly at downstream locations.
 - Runoff from rehabilitated and revegetated interim or final capped areas from which significant loads of pollutants are not anticipated to be generated. This type of water should be collected and conveyed appropriately but is not directed to site water treatment infrastructure, where practicable, such that that infrastructure can more effectively manage water types of higher risk.
- **Site (dirty) water:** Sediment laden runoff from disturbed catchments such as intermediate cover areas, non-revegetated interim cap and hardstands for disposal of bulky recoverable materials (i.e. green waste, metals and white goods). These catchment areas should be minimised, where practicable, and erosion control infrastructure should be installed, as required, to minimise the quantity of sediment generated. Sediment laden water generated from these areas is intended to be directed to a sediment control system such as a sediment basin.
- **Leachate:** Any water that has come into contact with waste is considered leachate and, as such, is treated separately.

Stormwater Drainage Infrastructure

As the topography of the site is quite complex, several drainage channels will be required to segregate clean water and site water, and direct site water into the sediment basins. The stormwater drainage infrastructure will be heavily dependent on the civil earthworks design for the various parts of the project particularly the access roads and mono cells as well as the staging of the mono cells.

All proposed diversion drains are expected to be in place for a period greater than 24 months with some being in place on a permanent basis. Therefore, they will be sized for the 100-year ARI (1% AEP) design event which is the major storm event listed in QUDM (2017).

In accordance with the International Erosion Control Association (IECA) guidelines (2008), drainage channels, whether permanent or temporary, will be designed and constructed at a slope that limits the flow velocity to a value not exceeding the maximum allowable velocity for the given surface material. Excessive flow velocities can cause channel erosion, usually along the invert of the channel, which can then lead to bank slumping and widening of the channel. The flow velocity can be reduced by either:

- Reducing the bed slope.
- Reducing the depth of flow (increasing the width of the channel).
- Reducing the peak discharge (reducing catchment area).
- Increasing channel roughness.

If the channel slope, width or depth cannot be altered, then two erosion control options remain as follows:

- Reduce the flow velocity through the placement of rock check dams; or
- Increase the effective scour resistance in the channel through the placement of a channel liner such as rock.

Figure 22 shows proposed water segregation and drainage channels around the mono cells.

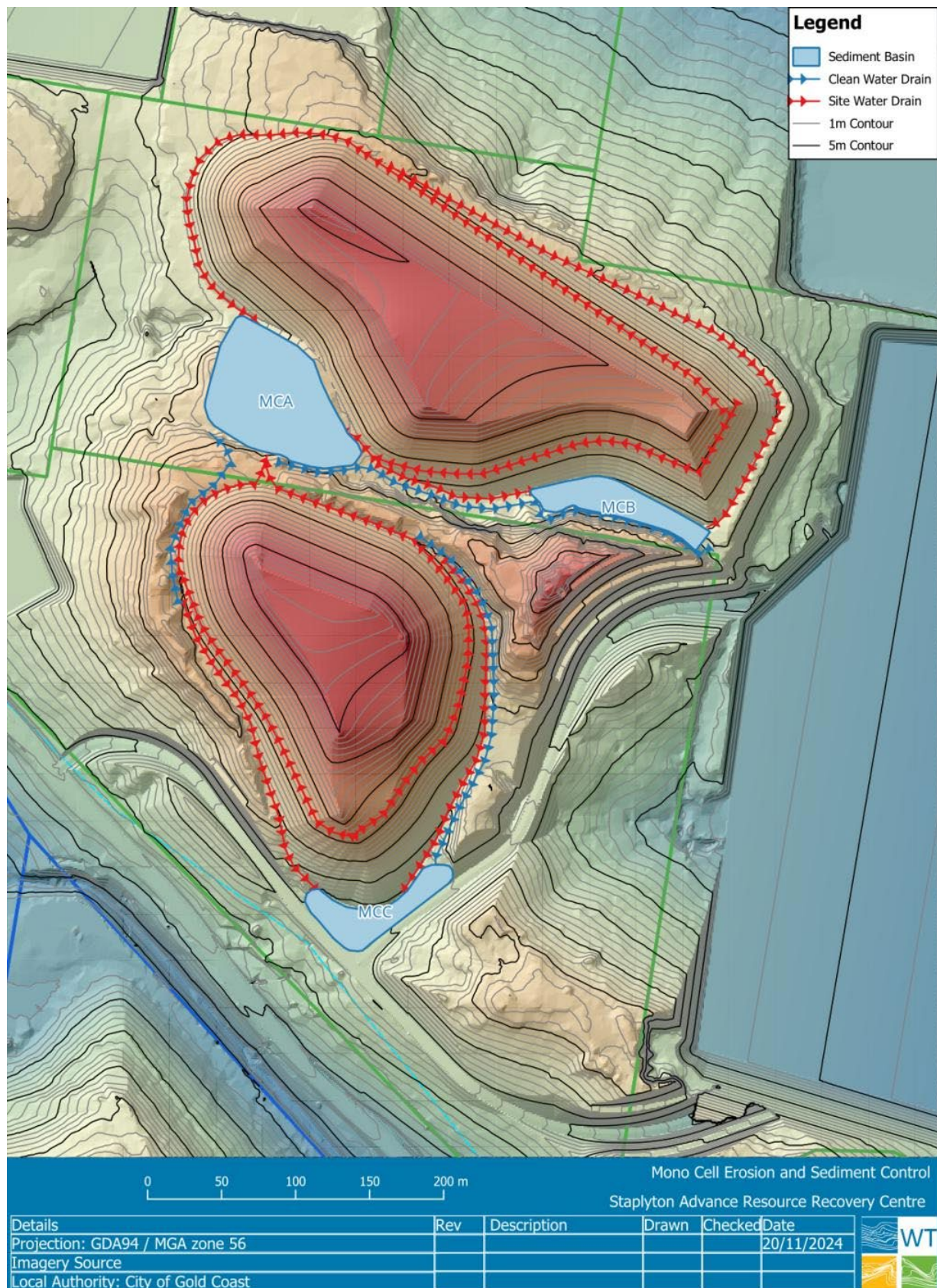


Figure 22 Proposed stormwater drainage around mono cells

Sediment Control Measures

The primary function of sediment control measures is to trap the coarser sediment fraction. Sediment basins are possibly the only sediment control techniques that have any significant ability to trap finer sediment particles such as silts or clays.

Primary Controls

A list of appropriate primary sediment control techniques is given in Table 33.

Table 33 Summary of Primary Sediment Controls

Technique	Typical Use
Sediment Basin	Best suited to fine grained or dispersive soils
High Efficiency Sediment Basin (Type A and B)	The duration of disturbance is greater than 12 months
	Effective in areas with restricted space
	(Type F and D)
(Type F and D)	The trapping of coarse and fine sediments
	Turbidity control
	Used when working in areas containing fine grained, dispersive or poor settling soils
DME (1995) Sediment Basin	Best suited for collecting runoff from large, long-term stockpiles with varying sediment and saline pre-disposition such as overburden and coal stockpiles
Rock Filter Dam	Locations where there is sufficient room to construct a large rock embankment
	The incorporation of a filter cloth is the preferred construction technique if the removal of fine-grained sediment is critical (high maintenance)

Supplementary Sediment Control Techniques

Supplementary sediment controls are used in areas where the catchment is small or the potential for producing sediment laden runoff is low. Appropriate supplementary sediment control techniques are listed in Table 34.

Table 34 Summary of Supplementary Sediment Controls

Technique	Typical Use
Check Dam sediment trap	Supplementary sediment trap in minor concentrated flow areas
	Trapping sediments in table drains and minor drainage lines
	Check dams may be constructed of rock, sand bags or compost filled socks
Buffer Zones/ Grass filter strips	Mostly suited to sandy soils
	Can provide some degree of turbidity control while the buffer zone remains unsaturated
Sediment Fence	Supplementary device for sheet flow from minor catchment areas
	Suitable for all soil types
	Require maintenance after every runoff event
Sediment Trench	Used in long, narrow spaces
	Supplementary sediment trap in minor concentrated flow area next to embankments such as haul roads and levee banks

4.2.7 Summary and Conclusions

Stormwater and surface water currently discharges from the numerous lots that form the ARRC precinct based on the existing topography into the surrounding environment via State-mapped and unmapped waterways, drainage channels, and drains. While the development of the ARRC as a whole is unlikely to significantly impact the surrounding land uses with regards to surface water discharges, it will be important to ensure that pollutants from the ARRC precincts, particularly those facilities considered ERAs, do not leave the site and do not impact the receiving environment.

As the ARRC project moves into the next stages of design, stormwater infrastructure for each facility, specifically designed to address applicable standards and requirements for ERAs and WSUD requirements will be developed. This infrastructure will likely include chutes and high-efficiency sediment basins to manage dirty (site) water, leachate collection systems for any water that comes into contact with waste in the mono cells, and swales and chutes for water that is considered clean.

4.3 Natural Hazards and Risks

4.3.1 Introduction, Purpose, and Scope

The ARRC will be located in the northern Gold Coast suburb of Stapylton, in an area where records and planning scheme information notes historical and future potential for flooding and bushfire are available. A flood impact assessment and bushfire risk review were conducted for the ARRC, utilising the existing environment descriptions and modelling where applicable to determine the immunity or vulnerability of the ARRC to natural hazards, and identify mitigation and controls that may be required to integrate into the developing design for each facility.

4.3.2 Existing Environment

Flooding

A saddle ridge line runs through the northern portion of the precinct and separates the Albert and Logan River Flood Plains. The area east of the precinct is part of the Woongoolba Floodplain. This is a flat landscape characterised by agriculture, primarily cane farms and cane drains. The floodplain is subject to regional flooding from the Logan-Albert River system and inundation from the Highest Astronomical Tide (HAT). Flood mitigation infrastructure such as tidal gates, open drains and flood levees are present on the floodplain. The footprints of the proposed ARRC facilities are generally located outside the defined flood event (DFE) for regional flooding.

The southern portion of the precinct is mapped as being impacted by flooding from Sandy Creek, a tributary of the Woongoolba Floodplain. This is influenced by regional flooding as well as 'local' flood events. Sandy Creek flows in an easterly direction, bordering the southern site. Downstream of the site, Sandy Creek flows into a series of cane drains before discharging into the Logan River and then Southern Moreton Bay. The proposed southern precinct footprint is outside of the DFE associated with Sandy Creek flooding.

Regional flooding in vicinity of the ARRC Precinct has been previously modelled as part of the Woongoolba Hydraulic Study (CoGC, 2014). This study aimed to investigate the performance of the Woongoolba Flood Mitigation Scheme (WFMS) and propose viable drainage upgrades. This investigation utilised an URBS hydrologic model and a MIKE11 one-dimensional hydraulic model to investigate regional flooding of the Woongoolba Floodplain. The Woongoolba Hydraulic Study from 2014 was based on current climate conditions and grids include climate change provisions (as relevant to the site) as follows:

- 0.8m projected sea level rise by 2100 (RCP 8.5)
- 10% increase in storm tide intensity
- 10% increase in rainfall intensity

Bushfire

Potential bushfire hazard areas mapped by the City Plan (version 12) in the vicinity of the ARRC are shown in Figure 23. The City Plan Bushfire Hazard Overlay Code constrains areas of land identified as very high, high, or medium bushfire hazard and potential impact buffers.

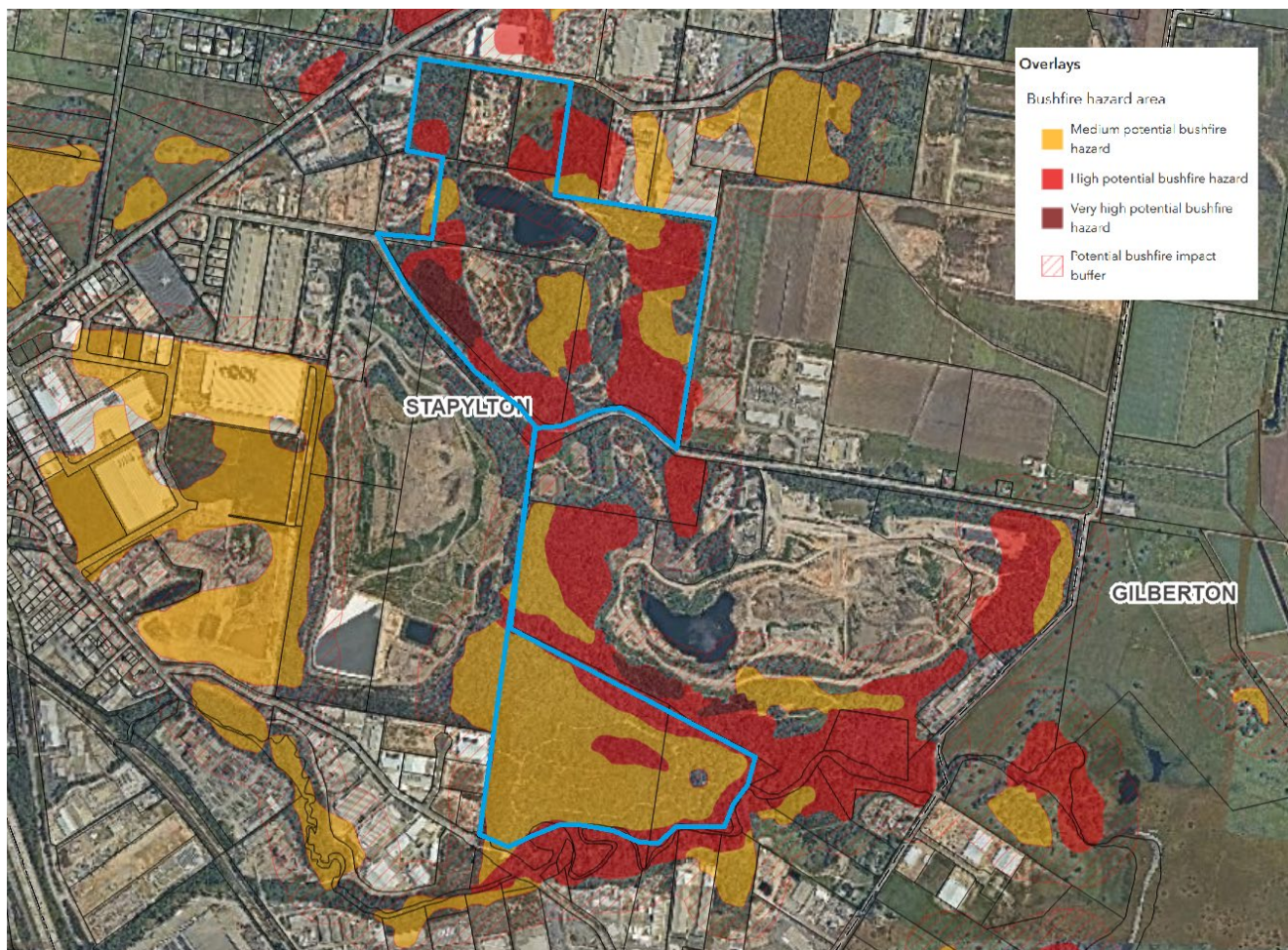


Figure 23 City Plan mapped bushfire hazard areas (blue outline = ARRC footprint, orange = medium hazard, red = high hazard, dark red = very high hazard, red hatch = potential impact buffer)

Bushfire potential hazards mapped within the ARRC precincts are present due to the dense vegetation that exists on much of the southern precinct and large areas of the northern precinct. Surrounding the ARRC development, bushfire hazards exist on the adjacent vegetated areas of the BMI landfill and east along the Sandy Creek riparian area. As much of the sub-regional area surrounding the ARRC has been deforested and either urbanised (west, north, and south) or converted to cropping land (east) very little mapped bushfire hazard exists.

4.3.3 Potential Impacts and Risk

Flood Risk and Levels

Minimum Design Levels

The City Plan provides the minimum designated flood level and associated freeboard requirements when setting design floor levels for the infrastructure proposed as part of the ARRC of the Flood overlay code. The relevant design standards identified for the ARRC facilities include:

- Major electrical infrastructure (including power stations) – 0.2% AEP + 500mm freeboard – residual WtE facility and ancillary activities
- Light industrial – 1% AEP (no freeboard specified) – MRF and Innovation Park

-
- Regional fuel storage – 0.5% AEP + 400mm freeboard – Hydrogen refuelling facility
 - Landfill – not specified

With respect to landfills, separation from surface water requirements is included in the DETSI Guideline – Landfill siting, design, operation and rehabilitation (DETSI 2021) and are summarised as follows:

- Where landfills are within the 1% AEP floodplain, additional engineering and management controls are required, and
- Indicative minimum buffer distance of 100m from surface waters and the ‘1% AEP flood plain’

While not yet formally implemented, an update to these guidelines includes minimum considerations for climate change and flooding, which have been utilised as standard for the purpose of this study.

Regional Flooding Review – Northern Precinct

The Woongoolba Hydraulic Study (CoGC 2014) result grids indicate that only the residual WtE facility potentially interacts with regional flooding. All other elements of the ARRC are located outside of the mapped extent, inclusive of site access from the surrounding road network. On this basis, only the residual WtE facility is required to consider regional flooding in design and for potential flood impacts.

Regional flood levels applicable to the residual WtE facility have been extracted from the Woongoolba Hydraulic Study (CoGC, 2014). Minimal earthworks are likely to be required to achieve flood immunity to the minimum flood immunity standard specified by the City Plan of 0.2% AEP + 500mm freeboard. The area subject to earthworks appears to be a ‘backwater’ area with little to no conveyance of floodwaters. This suggests that earthworks would have minimal potential to cause adverse flood impacts for design events up to and including the 0.2% AEP flood event.

A review of the concept bulk earthworks design suggests that the residual WtE facility will have a minimum pad level of approximately 11.0mAHD. This will provide the facility with approximately 5.7m of freeboard above the probable maximum flood level. Therefore, the residual WtE facility has effectively been made flood immune from regional flooding sources.

Regional Flooding Review – Southern Precinct

The Woongoolba Hydraulic Study (CoGC 2014) indicates the preliminary nominated extent for the southern precinct pad has been located outside of the regional flood extent for events up to and including the 0.05% AEP flood extent, noting that no bulk earthworks is available for the southern precinct to assess pad levels. The regional flood levels applicable to the southern precinct are generally the same in both the gully to the north and Sandy Creek to the south, as regional flooding in this area is largely backwater from the larger regional Woongoolba floodplain.

Hydrologic modelling was undertaken in URBS to inform hydraulic model inflows and critical storm events relevant to Sandy Creek, which borders the southern precinct. A hydraulic model was developed using the hydrologic model inflows to estimate design flood levels, depths, and velocities. The hydraulic model extends approximately one kilometre downstream of Sandy Creek at Burnside Road and extends to appropriate total inflow locations upstream of the southern precinct area. Several local inflow locations were utilised to represent

local sub-catchment rainfall volume. A preliminary review of the latest climate change parameters for climate change scenario for the year 2100 planning horizon indicate a 1.71 – 1.77 factor increase to design burst rainfall depths for the 1.5-hour and the 2-hour event respectively. This has been applied to the 'local' flood assessment, noting that this is a much more conservative approach than the City's 1.1 factor to represent climate change.

Results inclusive of climate change were generated for the enveloped critical durations as determined from the hydrologic model in consideration of the five focal locations identified from the hydrologic model. Results were then enveloped against the sampled 1%AEP regional flood level at Burnside Road (2.787mAHD), this regional tailwater has been adopted from the 1% AEP flood level. It is understood that the regional modelling includes an allowance for climate change by implementing a 10% increase in rainfall intensity. Results indicate that the 1%AEP peak flood levels downstream of Burnside Road are dominated by regional flood results, while the upstream flood levels are dominated by the local catchment.

Bushfire Risk

Much of the vegetation on the ARRC precincts is proposed to be removed to enable the development of the eight facilities. With the removal of this vegetation, the majority of the mapped bushfire hazard areas shown within the blue boundary on Figure 23 will also remove the risk of bushfire. Remaining vegetation mapped as bushfire hazard surrounding the ARRC north-east corner and surrounding the southern precinct will remain. As such, precautions will be taken and are currently being integrated into the design of each facility, including:

- Setbacks from vegetation in compliance with building regulations and Australian Standards to ensure that buildings are located minimum distances from vegetation prone to bushfire.
- Cleared easements and access tracks to manage vegetation on the ARRC where it is to be retained to ensure, in the event of a bushfire, property and people can remain at a safe distance and a fire can be safely managed.
- Access to hydrant water supply for emergency services across the ARRC precincts.
- Building compliance and approval in accordance with Australian Standards, integrating fire ratings and requirements.

In addition, prior to operations commencing for each facility, a bushfire management plan will be developed and submitted to the relevant State agencies for review and approval, to ensure that emergency services are familiar with the procedures for each facility and are satisfied that the ARRC complies with the required standards.

4.3.4 Summary and Conclusions

Modelling and assessment of both flooding and bushfire hazard for the ARRC precinct has been completed at a conceptual level to ensure that developing design phases integrate any identified requirements to ensure flood immunity and bushfire mitigation.

Flood modelling completed of the master plan level information indicated that the ARRC is mostly immune from regional flood risks, including climate change factors, with the exception of the southern precinct and residual WtE facilities, that are proposed to be designed to meet the necessary freeboard requirements and ensure immunity once developed.

An assessment of the City Plan's bushfire hazard for the ARRC precincts and the surrounding area adjacent indicated that the majority of bushfire risk currently present as a threat to the ARRC development exists on the site currently. With the proposal to remove a significant portion of the vegetation on site, it is assumed that the risk of bushfire will significantly decrease. Appropriate mitigation measures, including setbacks, hydrants, water supply and suppression, and management plans, will be integrated into the design for each facility, and plans approved by the relevant authorities prior to the commencement of operations.

4.4 Geology and Groundwater

4.4.1 Introduction and Scope

The ARRC precincts are to be constructed on previously disturbed land purchased by the City more than 20 years ago. The project will involve some excavation, including building footings and piling, some topographical changes – particularly in the northern precinct area where quarrying has significantly altered the landscape, and the infilling of voids with wastewater or solid waste – i.e., the stormwater management infrastructure across the site and the mono cells in the northern precinct. As such, it is important to understand the geological conditions and site topography to inform the design and enable an understanding of the site conditions. Additionally, due to the requirement to dewater the existing recycled water dam in the northern precinct and utilise existing legacy quarry voids for the mono cell infrastructure, it is important that the existing hydrogeological conditions are well understood to enable minimal impacts to water levels and dependent ecosystems when works commence. As a number of the precincts with the ARRC will conduct operations considered ERAs, the protection of land and groundwater will also be a statutory compliance aspect. As such, it is important to establish a reliable baseline of both groundwater levels and quality, across multiple seasonal conditions, to provide a basis of measurement of impact once operations commence.

The scope of the geology and hydrogeology studies, therefore, included:

- Desktop assessment of regional geology and topographical conditions for the site and the surrounding landscape, using publicly available databases, mapping, and information.
- Review of previous geotechnical studies where geological, groundwater, and soil conditions were described.
- Installation of groundwater monitoring bores across both the northern and southern precincts, with subsequent monthly monitoring for a minimum of 12 months, recording water level, and sampling water (where present) for a number of physico-chemical and metal parameters.
- Development of a hydrogeological model calibrated using available groundwater data, to determine the behaviour and extent of groundwater across the ARRC site as a baseline condition, considering seasonality.
- Application of simulations and scenarios to the hydrogeological model to determine the potential groundwater impacts associated with the project, and including impacts of climate change.

The findings of this work and the modelling have been summarised in this chapter and are available in more detail in a detailed technical hydrogeological report that is available on request.

4.4.2 Regional Geology and Topography

The ARRC area comprises a mixture of commercial operational and vacant vegetated land. Large portions of the Precinct were historically a quarry with unnamed dams present on the northern precinct and to the north of the southern precinct. The ARRC area contains large variations in topography, comprising 5 m and 50 m Australian Height Datum (AHD) in the northern precinct and 5 m and 10 m in the southern precinct.

Regional geology mapping (DNRME, 2022: 1:100,000) indicates that the ARRC is underlain by the Neranleigh-Fernvale beds from the Devonian-carboniferous age (Figure 24). This group comprises of mudstone, shale,

arenite, chert, jasper, basic metavolcanics, pillow lava, conglomerate. Related field observations by the City's consultants (WSP, 2024) also suggest that:

- Most of the site's bedrock and the land east of the coastal plain consists of Devonian-Carboniferous Neranleigh-Fernvale (DCf) beds, comprising steeply foliated phyllite and greywacke, with minor chert, conglomerate, and volcanic layers.
- The transition from residual soils to extremely weathered rock is difficult to define, being more of a transitional zone.
- Lower-lying valleys dissecting the eastern part of the site are likely infilled with relatively stiff, moderately over-consolidated terrace alluvium, representing deposits within the former upper stream valleys. These soils are primarily clay, grading to sandy clay.
- The valleys open into broad coastal plains underlain by soft, compressible alluvium that thickens eastward towards southern Moreton Bay.

The ARRC northern precinct, previously quarried for stone, features hilly terrain with former high points intersected by eastward-plunging valleys filled with alluvium sediments. These valleys extend into broad coastal alluvial plains, which comprise deposits from the Logan River delta deposited within the southern Moreton Bay area during the recent geological period. The natural geology beneath the site is known to exhibit levels of sulphate, manganese, aluminium, nickel, and zinc. As such ambient concentration of these elements should be expected.

Various geotechnical investigations have taken place prior to this assessment. A design report for the Stapylton Reclaimed Water Storage Dam (northern precinct) was conducted in 2003 (GHD, 2003). The following lithology was generally encountered in the three boreholes advanced at the site:

- Approximately 0.0 m below ground level (bgl) to 3.0 m bgl: sandy silt and gravelly silt or clay; and
- Approximately 3.0 m bgl to 15.0 m bgl: Greywacke rock (sandstone).

A factual geotechnical investigation was conducted by Soil Surveys Engineering Pty Ltd in 2010 (Soil Surveys Engineering Pty Ltd, 2010). Eleven boreholes were advanced within relative proximity to the northern and southern precincts, of which three were located within the current investigation area. Relevant lithology is summarised below:

- Approximately 0.1 m bgl to 4.40 m bgl: fill (silty or sandy gravelly clay and clayey sandy gravels); and
- Approximately 0.1 m bgl to 10.4 m bgl: either gravelly sandy clay and gravelly and clayey sand, or greywacke (sandstone) at varying depths.

Monitoring well installation works were undertaken throughout the northern precinct in July 2024 (PSP, July 2024). The following lithology was encountered:

- Approximately 0.0 m bgl to a maximum of 0.2 m bgl: fill material (gravelly sand and sand with cobbles);
- Approximately 0.0 m bgl to 2.0 m bgl: gravelly sand or sandy clay; and
- Approximately 2.0 m bgl to 24 m bgl: Sandstone rock.

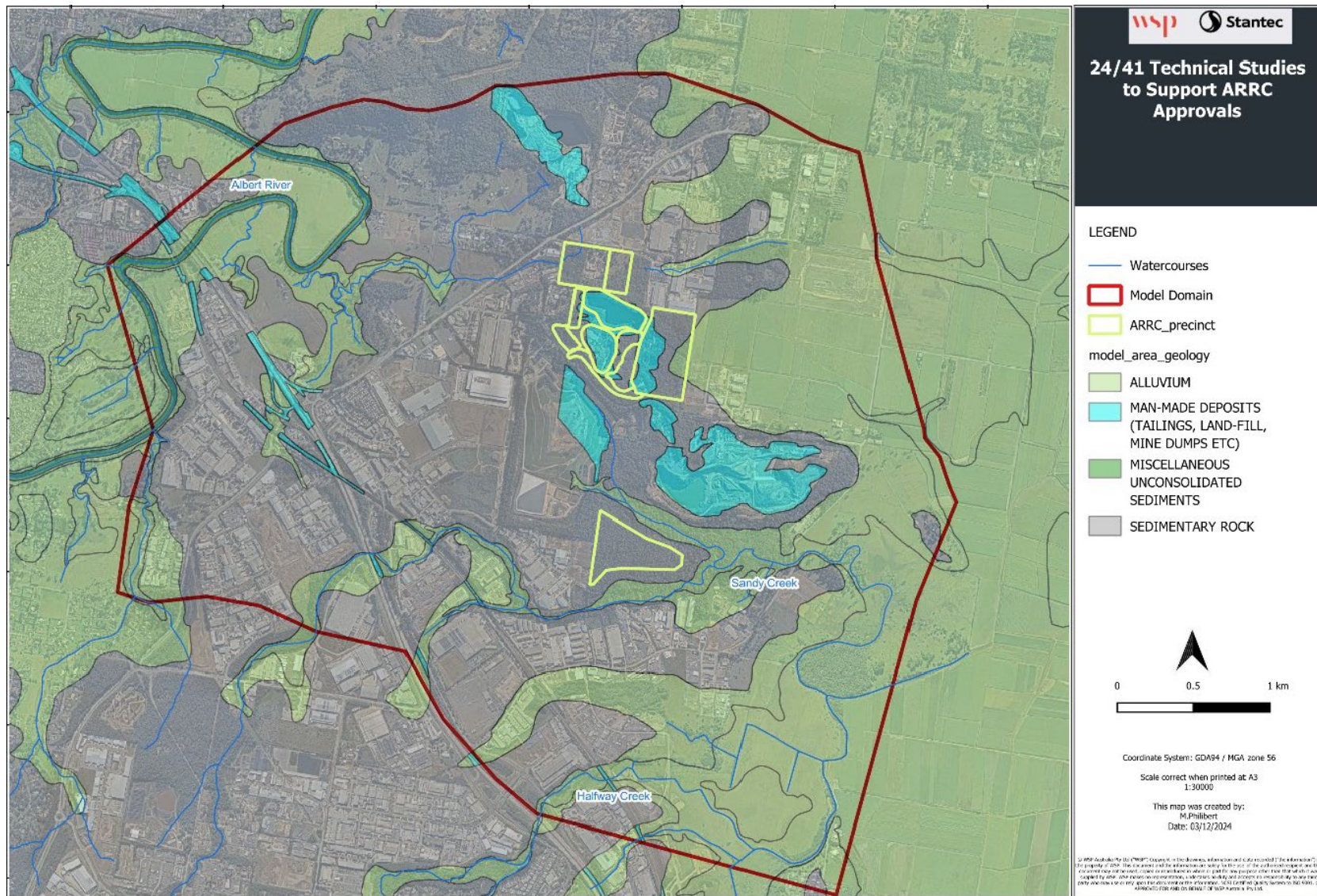


Figure 24 Regional geology (Queensland Globe data 1:100,000 Geological Map Sheet)

4.4.3 Rainfall, Climatic Conditions, and Evaporation

The climatic conditions in south east Queensland, where the ARRC is to be located, are subtropical, typically with warm to hot, higher rainfall summer seasons, and cooler, drier winter seasons. A weather station located at the Logan City Water Treatment Plant (station number 040854) is approximately 5 km from the project site and provides recorded weather data from 1889 to current. The mean monthly rainfall and evaporation data based on records between 1889 and 2023 are provided in Table 35.

Table 35 Logan City Water Treatment Plant mean monthly rainfall and evaporation data for the period 1889 to 2023

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean rainfall (mm)	155.2	165.5	154.5	102.8	92.9	75.1	54.8	42.4	46.0	78.9	91.3	127.7	1187
Mean evaporation (mm)	190.6	155.4	149.9	113.3	86.3	73.1	80.3	104.5	133.8	163.3	177.5	195.9	1624

Hydrostratigraphic Units

The following hydrogeological units have been recognised within the site and the surrounding area:

- Alluvium, residual soils
- Neranleigh-Fernvale beds:
 - Extremely weathered bedrock
 - Moderately weathered bedrock
 - Fresh bedrock

Hydraulic conductivity tests were performed in 22 monitoring wells during site investigations. These tests indicated the following main hydrostratigraphic units:

- Alluvium and residual soils
 - Alluvial soils: 2.6E-08 m/s to 9.6E-06 m/s, averaging 2.2E-06 m/s
 - Residual soils: 1.2E-07 m/s to 1.5E-07 m/s, averaging 1.3E-07 m/s
- Extremely weathered bedrock: 2.5E-08 m/s to 1.7E-06 m/s, averaging 5.4E-07 m/s
- Moderately weathered bedrock: 4.0E-09 m/s to 3.9E-06 m/s, averaging 9.6E-07 m/s
- Fresh bedrock: 8.8E-06 m/s to 1.0E-05 m/s, averaging 9.3E-06 m/s

4.4.4 Hydrogeological Conceptual Model

Methodology

Topography and Drainage

The area surrounding and including the ARRC consists of topography ranging from hilly areas in the north and north-east with elevations up to 130 mAHD to lower ground areas in the east and southeast with elevation close to 1.0 mAHD and 1.5 mAHD. Major watercourses include the Albert River, Sandy Creek, and Halfway Creek. Along with pit lakes and dams (such as the Yellowwood pit lake and BMI quarry pit lake) they shape the ground

surface and groundwater drainage pattern acting as groundwater discharge points. Groundwater table generally follows the topography with the groundwater flow direction from elevated areas toward lower elevation regions, and main water courses and pit lakes.

Groundwater Levels

Groundwater level data from the 27 groundwater monitoring wells installed around the ARRC precinct were used to determine the variability of levels across the site between 2022 and 2024. In the northern precinct, groundwater levels range from approximately relative level (RL) 1.4 mAHD to RL 33.4 mAHD, while in the southern precinct, levels range from about RL -0.55 mAHD to RL 1.5 mAHD. Correlation between ground surface elevation and the groundwater levels assessment was undertaken to investigate whether a correlation exists and whether it could be utilised for the development of conceptualised groundwater level contours within areas where no monitoring data is available to further support calibration of the numerical groundwater model.

The correlation was indicated to be strong for four data points associated with high groundwater levels. However, no clear correlation is indicated for levels below 18 mAHD, suggesting that the groundwater-to-ground surface relationship is influenced by other factors, such as the surrounding landscape features (including the adjacent Stapylton Landfill, BMI Landfill, Yellowwood quarry pit lake) and evapotranspiration. Considering that clear correlation exists only for four points, this was used as a guide only.

The groundwater levels across the study area are generally controlled by the main watercourses and pit lakes (BMI quarry pit lake, Stapylton Dam, and Yellowwood pit lake). These features significantly influence groundwater levels and flow directions. The groundwater levels within the eastern study area are close to the ground surface and potentially influenced by evapotranspiration. Overall, discounting influences of the pit lakes, the groundwater flow direction under the natural undisturbed conditions is expected to be from the central hilly area towards the main water courses (Albert River, Sandy Creek, and Halfway Creek) and low-lying land within the eastern area of the study area.

Based on the observations, the water table within the ARRC Precinct is most likely situated within the alluvium and extremely weathered bedrock, while the residual soil is likely to be unsaturated, i.e., dewatered. No sufficient data has been available to assess potential vertical head gradients between the hydrostratigraphic units.

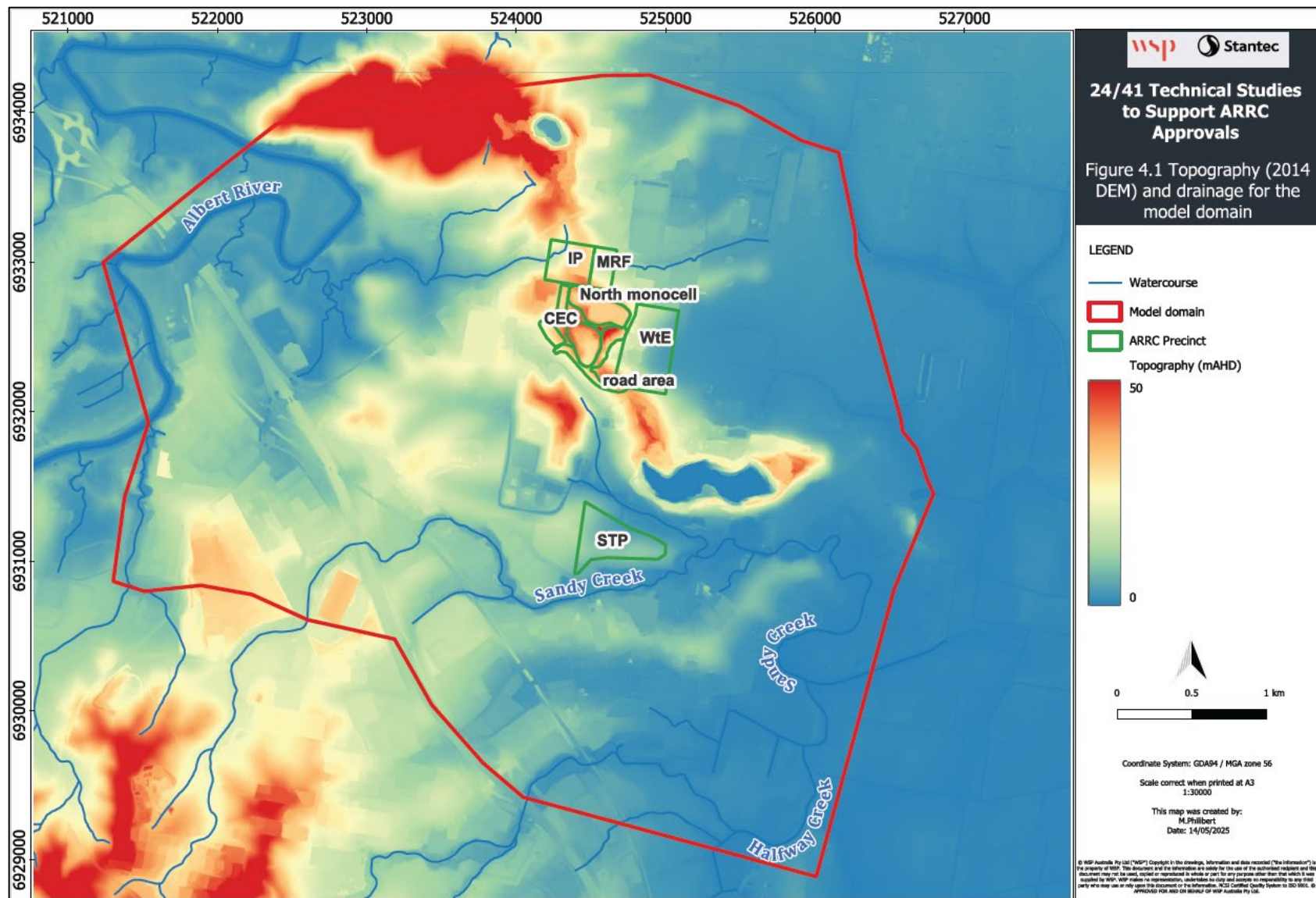


Figure 25 Topography and drainage for the hydrogeological model domain (shown as a digital elevation model output)

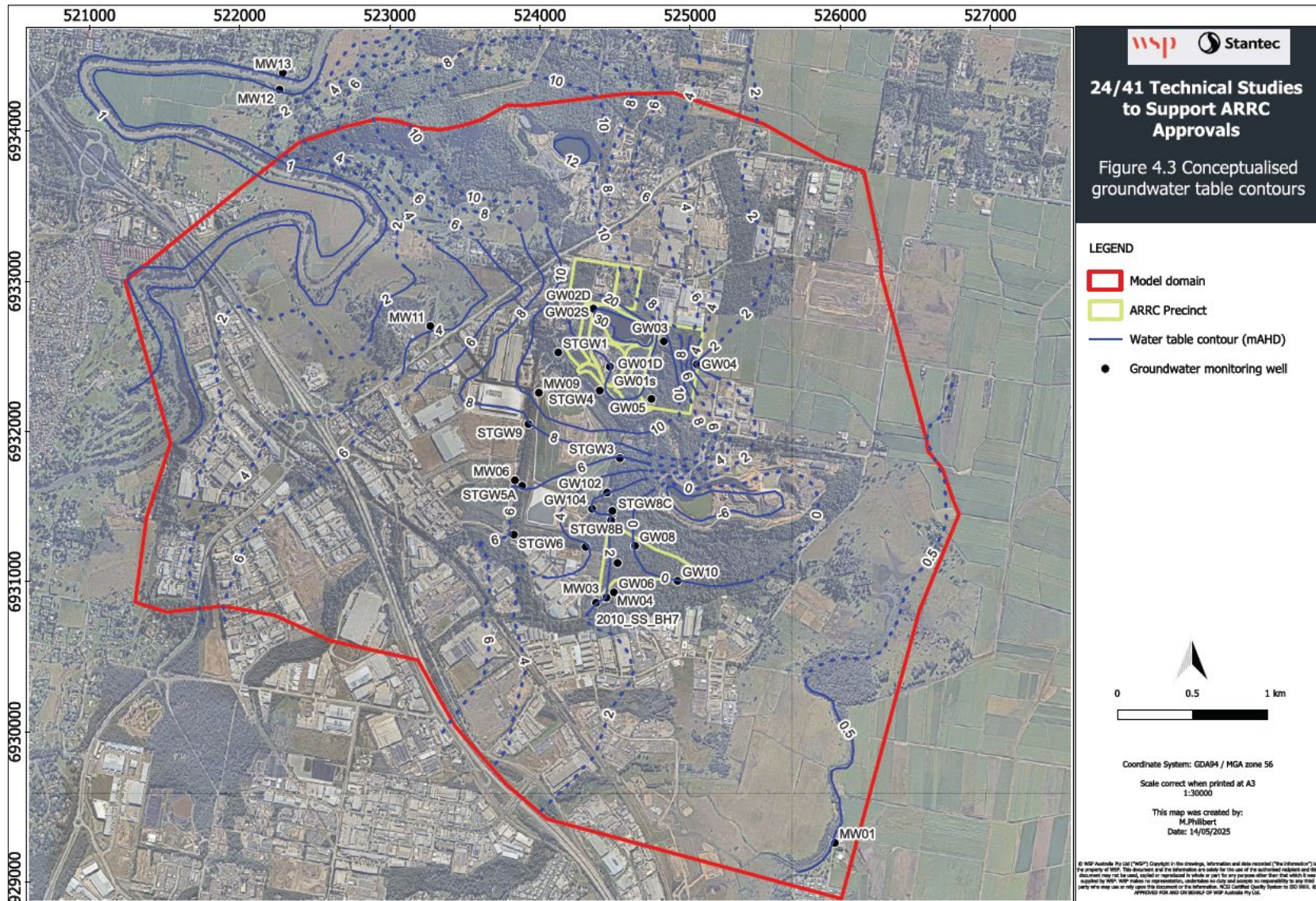


Figure 26 Location of groundwater monitoring bores (both project specific and publicly available) and conceptualised groundwater table contours

Recharge and Discharge

Prior to the development of the Stapylton Landfill, the site was dominated by remnant native vegetation and had an unnamed tributary of Sandy Creek flowing through it. Vegetative cover and the presence of natural drainage lines will have influenced the rate of groundwater recharge from rainfall. Recharge to groundwater within the areas with natural vegetation cover occurs through rainfall percolating through the upper soil and weathered bedrock profile and moving from upper horizons of soil and weathered bedrock to lower bedrock horizons where the groundwater table occurs. The development of Stapylton Landfill has altered the hydrological regime through the redirection of the unnamed tributary of Sandy Creek around the perimeter of the site (currently functioning as a clean water swale) and the removal of significant areas of vegetation to allow for cell construction and landfill operations. Rainfall that falls on the landfill cells percolates the waste mass below and is collected as leachate in the leachate collection system, i.e., it is not freely reaching the groundwater table beneath the landfill waste.

Groundwater within the bedrock aquifer system is likely to be hydraulically well connected with groundwater within the alluvium aquifer, which in turn is expected to be in a direct connection with the nearby creeks and rivers, such as Albert River, Sandy Creek, Halfway Creek and their tributaries. These hydraulic connections enable groundwater discharge from the deeper bedrock horizon into the existing watercourses to occur through the alluvial aquifer or versus wise, recharge from the watercourses to the bedrock aquifer through the shallower alluvial aquifer zones. Groundwater discharge through evapotranspiration is expected where the groundwater is shallow.

Groundwater Flow Model

A 3-dimensional (3D) groundwater flow model was developed using MODFLOW-USG, which is a relatively new version of the popular MODFLOW code (McDonald and Harbaugh, 1988) developed by the USGS. USGS MODFLOW has been the most widely used code for groundwater modelling in the past and has long been considered an industry standard. The selected Graphical User Interface was the Groundwater Visas 9 software (Rumbaugh, 2023).

The model domain area covers a spatial extent of approximately 29.7 km² (5.4 km in the north–south direction by 5.5 km in the west-east direction). The domain is bounded by the Albert River to the west and Halfway Creek to the south. This extent is based on the conceptualised groundwater flow system and locations of the water courses inferred to control the flow system. The boundaries of the model domain are positioned sufficiently far from the ARRC precinct not to influence modelling results.

The use of MODFLOW-USG allows the use of an unstructured or irregular mesh. For the ARRC, a Voronoi-based mesh has been adopted (Amenta, 1998), which has the advantage of being not only irregular, but maintaining a perpendicular line connecting adjacent cell-centres to the shared cell boundary. Use of the unstructured mesh allows for finer resolution, by using small cell sizes within the proposed ARRC Precinct and water courses (Albert River, Sandy Creek and Half Way Creek) while increasing the cell size in areas that are not near features of interest. Horizontally, the model domain is discretised into 318,150 active cells. The HydroAlgorithimics software “AlgoMesh2” was used to generate the 3D Voronoi cells grid. The final model mesh is shown in Figure 27.

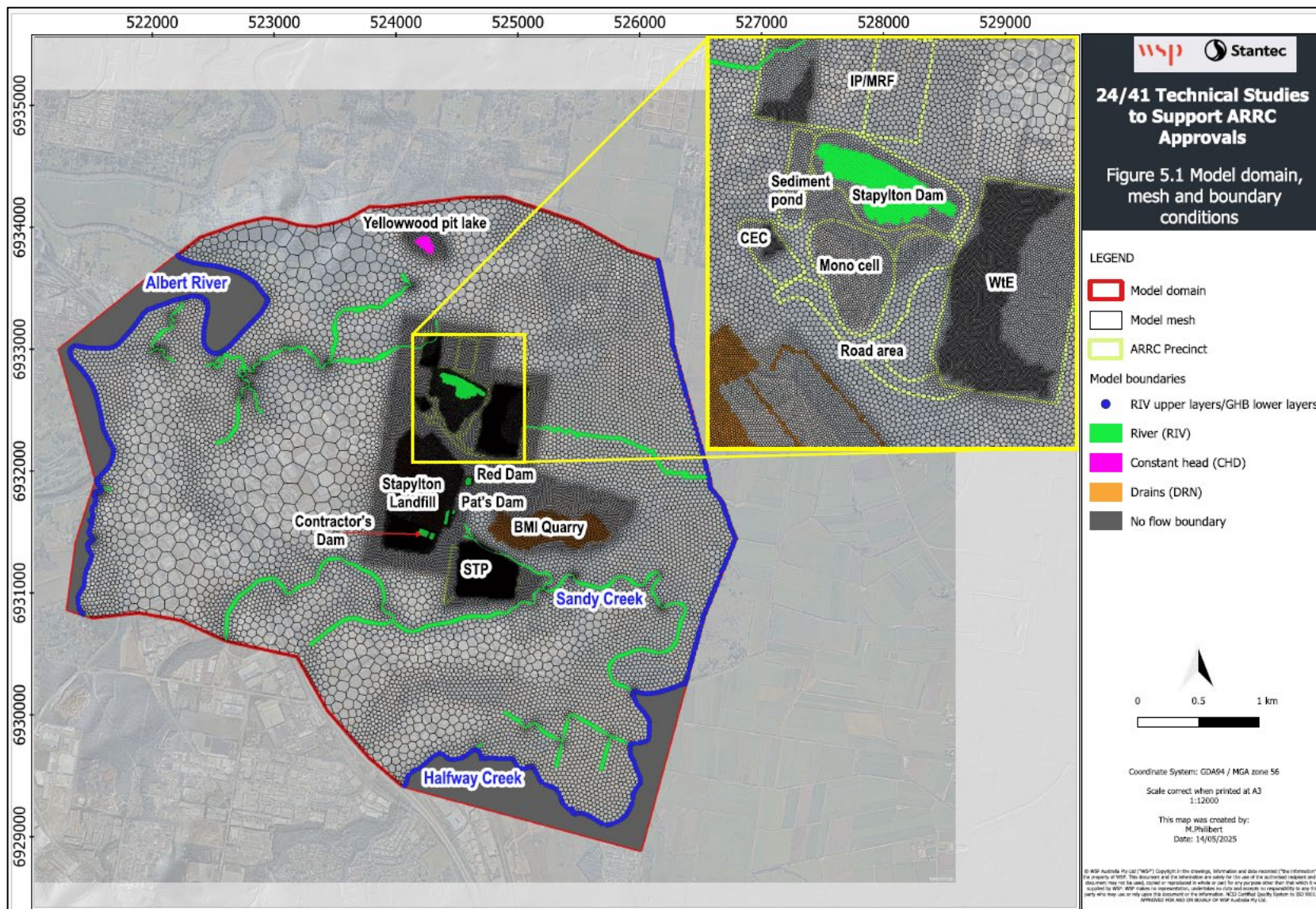


Figure 27 Model domain, mesh, and boundary conditions

The topography of the model within and in close vicinity of the landfill and ARRC was based on ARRC survey data provided by the City (5th June 2024). For the rest of the model domain, elevation data was sourced from publicly available databases: ELVIS (Elevation and Depth – Foundation Spatial Data and ICSM (Intergovernmental Committee on surveying and mapping)). Vertically, the model is discretised into 11 model layers. The use of MODFLOW-USG allowed layers to pinch out where the layer thickness was less than 0.1 m.

The boundary conditions applied to the model included the following:

- River boundary conditions (Albert River, Sandy Creek, and their tributaries; non-perennial streams and ephemeral drainage lines; permanent water storages located on Stapylton Landfill and the ARRC precinct).
- Constant head boundary conditions (applied at Yellowwood Pit Lake).
- General head boundary conditions (along the eastern, western, and southern boundaries).
- Drain boundary conditions (assigned to the BMI quarry pond to the east, and the Stapylton Landfill leachate collection system to the west).
- No-flow (zero flux) boundary conditions (applied to the edges of the model domain where no other boundary conditions were applied).

The dominant mechanism for recharge to the groundwater system is through diffuse infiltration of rainfall through the soil profile and subsequent deep drainage to underlying groundwater systems. Diffuse rainfall recharge to the model was represented using the MODFLOW-USG Recharge package. Separate model recharge zones were defined based on the surface geology unit and surface cover. The recharge values within each recharge zone were adjusted during the calibration process.

The MODFLOW Evapotranspiration package was used to simulate evapotranspiration from the groundwater system. Evapotranspiration zone in the vertical direction is defined by the top of the model elevation and evaporation extinction depth. If the water table rises above the top of the model elevation, the evapotranspiration occurs at the maximum evapotranspiration rate. If the water table falls below the evapotranspiration extinction depth, evapotranspiration ceases. If the water table elevation lies between these two extremes, the evapotranspiration rate varies linearly with depth. The evapotranspiration zones are defined based on the land uses, which were defined from the aerial photos. Time-variant evapotranspiration rates were set as a percentage of actual evaporation. The evapotranspiration extinction depths were set based on the ground cover and land uses. The shallow depths were set for the urban area and greater depths for the tree-covered areas. Recharge and evapotranspiration were not applied to the RIV package cells. The dimensions of the recharge and evapotranspiration zones vary over time to capture changes in site conditions.

The model was calibrated using manual calibration methods, performing transient calibration with recorded average climate data over a 10-year period to replicate season climate variations. Groundwater information was tested statistically using residual error and scaled root mean squared error to determine the error percentage of predicted data against collected data (due to the lack of longer-term monitoring data available). Note that models will be recalibrated using collected data once sufficient data (more than 3 years) has been collected.

Simulations

The potential effects of the proposed ARRC designs/layout on groundwater were assessed by making comparisons between a baseline conditions predictive run and a future predictive run (with ARRC Precinct).

Three main predictive model scenarios were run:

- Baseline Scenario – a ‘no ARRC design plan’ or ‘existing’ run (as per Australian Groundwater Modelling Guidelines), that is a simulation of existing conditions without any of the stages of ARRC.
- Scenario 1 – ARRC design plan with long-term average rainfall and 100 years post-filling.
- Scenario 2 – ARRC design plan with 75 percentiles of all historical recorded seasonal rainfall and 100 years post-filling.

Scenarios 1 and 2 include dewatering for the northern and southern precinct facilities, as well as Stapylton Dam. An allowance was made in the model to maintain groundwater levels at the base of the Stapylton Dam if groundwater levels rebound back following the lake dewatering. No dewatering was required for the southern mono cell, as its base is located above the water table. Scenarios 1 and 2 models included an allowance for leachate extraction from the drainage layer if groundwater levels increased above the top of the liner. This condition was introduced in the model following the placement of the liner. All future scenarios include the simulation of Stapylton Landfill operations.

The modelled groundwater contours beneath the mono cell liner for Scenario 1 and Scenario 2, at the end of the Southern and Northern mono cells filling (in 2041 and 2070, respectively) were modelled and results indicated the following:

- Northern Mono-cell (year 2041):
 - Groundwater levels range from 8 mAHD to 10 mAHD for Scenario 1.
 - Groundwater levels range from 9.5 mAHD to 11.5 mAHD for Scenario 2.
- Southern Mono-cell (year 2070):
 - Groundwater levels range from 9 mAHD to 10 mAHD for Scenario 1.
 - Groundwater levels range from 10.5 mAHD to 11.5 mAHD for Scenario 2.

For both the northern and southern mono cells, groundwater levels differ by approximately 1.5 mAHD between Scenario 1 and Scenario 2. Groundwater levels are higher in Scenario 2 for both mono cells.

Maximum groundwater drawdown associated with all ARRC Precinct future development is obtained by comparing the simulated groundwater levels from Scenario 1 or Scenario 2 to Base case at matching times. These drawdowns do not apply to a particular model time but are based on the maximum drawdown calculated by model that occurred at any time during simulation. Modelling indicated the following:

- In both scenarios, the drawdown reaches a maximum of 10 m and are due to dewatering Stapylton Dam.
- The extent of drawdown illustrated by 1 m contour suggest drawdown in south and south-east areas generally remain within the project area. However, in north and north-west areas 1 m contour is

indicated to extent about 200 m beyond the project area. This means that drawdown is associated with the project development will be mainly localised within the project area.

- The extent of the 1 m groundwater drawdown contour to the north and south of the excavation areas is slightly greater in Scenario 1 than in Scenario 2 but remains generally similar.
- The groundwater drawdown around the ARRC southern precinct due to excavation was negligible (less than 0.1 m).

The above results assumed that the excavation activities will be completed within three months. If the excavation takes longer, the following outcomes are expected:

- The maximum drawdown beneath the excavation will remain the same.
- The extent of the drawdown will be greater than shown above, depending on the duration of the excavation.

Summary of Findings and Conclusions

The groundwater numerical model was developed to evaluate the potential impacts of the ARRC Precinct future design on the local groundwater system. In particular, the study focused on groundwater inflow into excavations associated with the construction of facilities, groundwater drawdown and post-filling impacts. The study relied on the revision of the regional geology using latest available site-specific data, hydrogeological units and historic data (i.e., groundwater levels, rainfall and evapotranspiration) for model calibration and predictive simulations.

Across all scenarios, mass balances discrepancies were negligible (<0.01%). In Scenario 1 and 2 predicted inflows are dominated by rainfall recharge (90-92%) and stream leakage (3-5%) while inflows from neighbours' quarry and leachate discharge accounts for approximately 2% of modelled inflows.

The simulated groundwater inflow into excavations and fluxes are indicated to be low, as follows:

- Scenario 1: excavation inflow - 0.023 ML/d (22.7 m3/d); maximum groundwater fluxes associated with Stapylton Dam dewatering – 2.44 ML/d (2440 m3/d)
- Scenario 2: 0.025 ML/d (24.8 m3/d); maximum groundwater fluxes associated with Stapylton Dam dewatering – 2.44 ML/d (2440 m3/d)

In both Scenario 1 and 2, the drawdown reaches a maximum of 10 m, which is associated with the dewatering Stapylton Dam. The groundwater drawdown around the ARRC southern precinct due to excavation was negligible (less than 0.1 m).

The sensitivity runs estimated:

- Total inflow into excavation in the range of 0.007 ML/d (7.5 m3/d) to 0.07 ML/d (69.7 m3/d).
- Maximum groundwater fluxes associated with Stapylton Dam in the range from about 2.5 ML/d (24,775 m3/d) to 2.4 ML/d (2,380 m3/d).

Once the Stapylton Dam has been dewatered for approximately one year, groundwater levels are indicated to remain below the base of the Stapylton Dam. Groundwater levels are predicted to remain at least 4 m beneath the mono cell liner for all simulated scenarios.

4.5 Contaminated Land

4.5.1 Introduction and Scope

Initial desktop reviews of environmental aspects indicated the potential presence of contamination, acid sulfate soils (ASS), and historical land uses that included ERAs and notifiable activities on a number of the lots that make up the ARRC project site. To further investigate the potential for ASS and contaminated land within the proposed project area, contaminated land investigations were commissioned to determine the following:

- Historical land uses that may have caused contamination of the ground, including any lots listed on the Queensland EMR or Contaminated Land Register (CLR)
- ERAs that have occurred within or adjacent to the project area that could have caused contamination
- Confirmation of any ASS on site that will require management during construction
- Any specific concerns relating to contaminated land

These tasks were completed in four steps:

1. Desktop review of historical photographs, Queensland Government databases and mapping, and surrounding land use information.
2. Development of a preliminary Conceptual Site Model (CSM) that addresses potential contamination sources, transport mechanisms and pathways for contamination, and sensitive receptors, developed based on the preliminary information ascertained from the desktop assessment process.
3. Site investigations, including soil and groundwater sampling and analysis at targeted locations within the ARRC project boundary as identified to be of relevance for contaminated land and ASS investigation.
4. Refinement of the CSM utilising the findings of field investigations.

Following completion of these four steps, discussion of the results and conclusions were developed that include appropriate mitigation and management measures to be carried forward through the design and construction phases of the project. Note that this chapter provides a summary of the detailed technical contaminated land investigation report that is available on request.

4.5.2 Existing Land Uses and Site Context

Historical Land Uses

A review of historical aerial imagery including the site was undertaken with a summary description of observed land uses provided in Table 36. Note that historical aerial imagery is only available open-source from 1955 onwards.

Table 36 Summary descriptions of historical aerial imagery

Date of Image	Description of ARRC Site Area	Description of Surrounding Landscape
1955	The northern precinct area is predominantly forested with visible access tracks resembling modern day Quarry Road and Rossmanns Road.	The northern and southern precincts are surrounded by partially cleared, undeveloped rural land with remnant vegetation visible.

Date of Image	Description of ARRC Site Area	Description of Surrounding Landscape
	<p>4RP110743 is predominantly cleared with remnants of vegetation visible in the south-eastern corner. An access track transects from the central northern area to the southern boundary.</p> <p>5RP110743 is two-thirds cleared.</p> <p>A cleared portion of 1SP171268 is visible along the south-east boundary.</p> <p>The western lot of the southern precinct is forested land with an access track visible. The eastern lot is cleared, open land.</p>	<p>Partially excavated land is visible north-east of the southern precinct and a creek, today identified as Sandy Creek, can be identified wrapping around both lots from the northern and eastern boundary to the southern boundary.</p>
1965	<p>Evidence of land clearing occurring in the 10 years since 1955 is visible throughout the northern precinct lots.</p> <p>Continued clearing of 4RP110743 is evident throughout the south-east portion.</p> <p>Clearing continues on 5RP110743 with an access track visible that transects from the northwest to western boundary.</p> <p>A small structure is visible on the north-west corner of 6RP110743, potentially a dwelling.</p> <p>The southern precinct area is relatively unchanged from the 1955 image.</p>	<p>Minor excavation works can be seen south-east of the northern precinct area opposite Rossmanns Road.</p> <p>Further excavation works are visible north-east of the southern precinct as well as vegetation clearing to the south.</p>
1974	<p>Imagery shows quarrying activities on the northern precinct have commenced, with further vegetation clearing and excavation across 2SP171268. Excavations extend into the south-west corner of 1SP171268.</p> <p>The southern precinct area has been largely cleared of vegetation.</p> <p>A small waterbody is visible on 4RP110743 (and remains unchanged presently).</p> <p>Quarry Road can be identified extending to the northern precinct area.</p>	<p>A small reservoir is visible to the north-west of the northern precinct, with multiple dwellings also present. Land east of the northern precinct has been cleared and developed for agriculture.</p> <p>Further clearing and tracks have been cleared south of the southern precinct.</p>
1978	<p>Excavations have extended into the central north-west portion of 1SP171268 with additional tracks visible across the entire northern area. The density of trees in the northern portion of 6RP110743 have visibly reduced since 1974.</p> <p>The southern precinct remains in a similar condition to that shown in 1974.</p>	<p>Multiple rural residential dwellings can be identified south of the southern precinct area, with additional tracks cleared.</p>
1987	<p>Continued land clearing and deeper excavations are visible in the northern precinct, showing clear evidence of active quarrying.</p>	<p>Further excavations are evident south of Rossmanns Road.</p> <p>Quarrying works appear to have commenced north-east of the northern precinct.</p>

Date of Image	Description of ARRC Site Area	Description of Surrounding Landscape
	<p>A building is present in the central-northern section of 5RP110743, roads have been developed and vehicles are visible.</p> <p>A residential building is apparent in the north-west corner of 6RP110743 and a small waterbody can be seen at the north-east boundary.</p> <p>Regrowth vegetation can be seen across 4RP100743.</p> <p>The southern precinct remains relatively unchanged from 1978, with some evidence of vegetation regrowth visible.</p>	
1997	<p>Continued quarrying is evident across 1SP171268, particularly within the south-east portion. The quarry appears well established, and water appears to be ponding in certain areas of the quarry.</p> <p>The southern precinct appears similar to the 1987 image.</p>	<p>Industrial developments are visible west of the northern precinct and continued quarrying/excavation works are apparent south of Rossmanns Road.</p> <p>West of the southern precinct, a portion of land has been cleared of vegetation. An increase in low density residential dwellings are visible to the south.</p>
2004	<p>The northern precinct quarry void has been excavated to a similar extent as is visible in the present day. Water is visible, indicating the use of quarry voids for water storages.</p> <p>A second, larger building has been constructed in the western central part of 5RP110743. Additionally, a small waterbody is visible on the eastern boundary.</p> <p>The southern precinct remains unchanged.</p>	<p>Further excavation and quarrying works are visible south of Rossmanns Road.</p> <p>Industrial developments can be seen south of the southern precinct.</p>
2014	<p>The recycled water dam on the northern precinct is visible, with the dam wall and other infrastructure associated visible. Quarrying activities on site appear to have ceased and the aerial image resembles the current state.</p> <p>Clearing has progressed on 5RP110743 with several buildings visible on the site.</p> <p>A cleared access track is visible forming a loop around the southern precinct.</p>	<p>Several industrial developments have been constructed directly south and west of the southern precinct. The quarry to the north has been converted into a dam.</p>
2024	<p>Present day images show both the northern and southern precincts remain relatively unchanged from 2014, with evidence of continued vegetation regrowth visible.</p>	<p>Industrial developments surround the northern and southern precincts.</p> <p>The quarry to the north of the southern precinct has been converted to a landfill.</p>

Environmentally Relevant Activities

A total of 16 ERAs were identified within a 500m radius of the ARRC project area. Of these 16, a total of eight were identified immediately adjacent and are presented in Table 37. No ERAs were identified on the lots associated with the ARRC itself.

Table 37 ERAs immediately adjacent and within a 500m radius of the ARRC

Licence Number and ERA(s)	Lot Reference and Location	Comments
P-EA-100428361 ERA 62 – Resource recovery and transfer facility operations (1(b) receiving, sorting, dismantling, bailing, or temporarily storing general waste) ERA 54 – Mechanical waste reprocessing (2(c) more than 10,000t per year) ERA 8 – Chemical Storage (4 storing 200t or more of chemicals that are solids or gases) ERA 44 – Glass or glass fibre manufacturing (more than 200t per year)	Lot 2 WD4654 and Lot 2 SP189552 North of the northern precinct.	The site (owned by Visy Glass) is currently under construction.
EPPR00981913 ERA 38 – Surface coating (2 coating, painting or powder coating more than 100t of materials in a year) ERA 19 – Metal forming; hot forming more than 10,000t of metal in a year	Lot 2 SP189558 North of the northern precinct.	Numerous commercial and industrial buildings.
EAF-8009024 ERA 62 – Resource recovery and transfer facility operations (1(a) operating a facility for receiving, sorting, dismantling, bailing or temporarily storing scrap metal, non-putrescible waste, or green waste only)	Lot 9 RP110743 South-east of the northern precinct.	Appears to be a storage yard for vehicles and parts associated with wreckers.
EPPR00829313 ERA 54 – Mechanical waste reprocessing (1 operating a facility for receiving more than 5,000t of inert, non-putrescible waste or green waste only) ERA 62 – Resource recovery and transfer facility operation (1(b) operating a facility for receiving, sorting, dismantling, bailing or temporarily storing general waste; 1(c) receiving, sorting, dismantling, bailing or temporarily storing category 2 regulated waste; 1(d) receiving, sorting, dismantling, bailing or temporarily storing category 1 regulated waste)	Lot 2 RP153665, Lot 2 RP153665, Lot 3 RP209307, Lot 1 RP6936, Lot 466 W312186 North-west of the southern precinct; south-west of the northern precinct.	City's municipal landfill (Stapylton Landfill)

Licence Number and ERA(s)	Lot Reference and Location	Comments
ERA 60 – Waste disposal (2(h) operating a facility for disposing of more than 200,000t of specific waste in a year)		
P-EA-100347117 ERA 54 – Mechanical waste reprocessing (1 operating a facility for receiving more than 5,000t of inert, non-putrescible waste or green waste only; 3(a) operating a facility for receiving less than 5,000t of category 2 regulated waste) ERA 62 – Resource recovery and transfer facility operations (1(a) operating a facility for receiving, sorting, dismantling, bailing or temporarily storing scrap metal, non-putrescible waste, or green waste only) ERA 33 – Crushing, milling, grinding or screening more than 5,000t of material in a year.	Lot 1 SP279441 South-east of northern precinct. Adjacent to southern precinct.	Historical quarry now functioning as a landfill and recycling centre. Predominantly recycling construction materials (BMI Stapylton Resource Recovery).
P-EA-100287544 ERA 53 – Organic material processing ((a) more than 200t of organic material in a year by composting) ERA 54 – Mechanical waste reprocessing (1 operating a facility for receiving more than 5,000t of inert, non-putrescible waste or green waste only) ERA 62 – Resource recovery and transfer facility operation (1(b) operating a facility for receiving, sorting, dismantling, bailing or temporarily storing general waste; 1(c) receiving, sorting, dismantling, bailing or temporarily storing category 2 regulated waste; 1(d) receiving, sorting, dismantling, bailing or temporarily storing category 1 regulated waste) ERA 60 – Waste disposal (1(d) operating a facility for disposing of more than 200,000t of specific waste in a year) ERA 16 – Extraction and Screening (2(c) extracting other than by dredging more than 1,000,000t in a year)	Lot 2 SP279441, Lot 3 SP279441 South-east of the northern precinct, adjacent to the southern precinct.	Historical quarry now functioning as a landfill and recycling centre. Predominantly recycling construction materials (BMI Stapylton Resource Recovery).
EA0001743 ERA 63 – Sewage Treatment (2 operating a sewage pumping station)	Lot 100 SP260810 Adjacent to the southern precinct	City-owned sewage pump station (DA12)
P-EA-100145021 ERA 62 – Resource recovery and transfer facility operations (2 operating a facility for	Lot 6 SP274108 Adjacent to southern precinct.	Appears as an engineering workshop and yard. Storage of trucks and machinery

Licence Number and ERA(s)	Lot Reference and Location	Comments
receiving, sorting, bailing or temporarily storing end-of-life tyres only) ERA 54 – Mechanical waste reprocessing (3(a) operating a facility for receiving less than 5,000t of category 2 regulated waste)		observed in northern portion of lot.

Environmental Management and Contaminated Land Registers

Lot 12 SP109916, the eastern lot of the southern precinct, is listed on the EMR for petroleum product/oil storage.

Acid Sulfate Soils

A review of the Australian National Soil Information System (ANSIS, 2024) found that the proposed development footprint is mapped as low probability of occurrence of ASS. An interrogation of Queensland Globe (2025) ASS mapping (1:25,000 scale) indicates that there is the potential for ASS to occur on the eastern portion of lot 1SP171268 (the residual WtE site) with land (LP) greater than or equal to 5m AHD with low probability of ASS, and LP5 with land above 5m AHD with low probability of ASS. Similarly, the southern precinct (lots 36SP222486 and 12SP109916) indicate both (LP) greater than or equal to 5m AHD with low probability of ASS as well as A1 depth to actual ASS 0.5-1m along Sandy Creek on the southern boundary and the unnamed tributary of Sandy Creek along the northern boundary of the site. Extensive testing for ASS will be completed in the next phase of design to determine the risk during construction and appropriate management measures to be integrated into the CEMP and construction management plan. In the southern precinct, mapped areas of known ASS along the creeks will be avoided through the implementation of buffers/setbacks from the creeks (approximately 80-100m).

It is acknowledged that there is the potential for acid sulfate rock to be present with the Neranleigh-Fernvale beds, however as proposed works are not intending to intersect these layers, acid rock has not been considered.

4.5.3 Preliminary Conceptual Site Model

The CSM addresses potential contaminant sources, transport mechanisms/pathways and sensitive receptors. The CSM provides an overview of the following:

- Potential areas of environmental concern (AECs), including potentially affected media (soil, sediment, groundwater, surface water, etc.) contaminants of potential concern (COPCs) and the mechanism(s) of contamination (i.e. nature of the source release into the environment);
- Potential transport and exposure pathways; and
- Identification of sensitive receptors (both human and ecological).

Contaminants of Potential Concern

The surrounding land use suggests that an array of contaminants of potential concern (CoPC) may be present at the ARRC site. It is noted that the majority of the surrounding lots contain extensive landfilling operations. The

following CoPC selected for the investigation were identified as potential indicators of typical landfill activities and include:

- Metal(loids)s: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb), zinc (Zn) and mercury (Hg)
- Per- and Polyfluoroalkyl Substances (PFAS – 28 compounds)
- Polychlorinated biphenyls (PCBs)
- Organochlorine and organophosphorus pesticide (OCP/OPPs)
- Total recoverable hydrocarbons (TRH)
- Polycyclic aromatic hydrocarbons (PAH)
- Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene (BTEXN)
- Volatile organic compounds (VOCs)
- Semi-volatile organic compounds (SVOCs)
- Asbestos
- Cyanides (free and total)
- Nutrients (ammonia, phosphorous)
- Phenolic compounds

Sensitive Receptors and Exposure Pathways

Table 38 presents a summary of the potential sources of contamination, sensitive receptors, exposure pathways, and the associated risks under the current, proposed, and future land use setting.

Table 38 Potential sources of contamination, sensitive receptors, exposure pathways, and risks associated with past, proposed, and future land use

Sources and Contaminants	Sensitive Receptor	Pathway			Qualitative Risk Change (associated with proposed development)
		Current Land Use	Construction Land Use	Proposed Future Land Use	
Contaminants in soil: <ul style="list-style-type: none"> • PFAS • Hydrocarbons (TRH, BTEXN, PAH) • PCBs • Metals • VOC/SVOC • Pesticides • Cyanide • Ammonia • Phosphorus • Phenols • Asbestos 	Precinct / construction / operations / maintenance workers	Incidental direct contact with impacted soils Incidental contact with or ingestion of groundwater or surface water	Increased contact with impacted soils and/or sediments during the construction phase of works Increased contact with or ingestion of groundwater or surface water Inhalation dust emissions during construction work Vapour inhalation	Direct contact with impacted soils Incidental contact with or ingestion of groundwater or surface water Vapour inhalation	Increased risk associated with construction works Reduction of long-term risk as less soil will be exposed
	General public	Direct contact with impacted soils	Fugitive dust emissions associated with construction works	Direct contact with impacted soils	Increased risk during construction period due to disturbance of soils
	Aquatic ecosystems	Mobilisation of soil-bound contaminants into groundwater during rainfall events or periods of elevated groundwater. Mobilisation contamination to surface waters Vertical percolation of contamination from soil to groundwater, migration to surface water	Increased mobilisation of contamination due to soil profile disturbances and potential impacts to groundwater levels (associated with earthworks) Increased vertical percolation of contamination from soil to groundwater, migration to surface water (associated with earthworks)	Mobilisation of soil-bound contaminants into groundwater during rainfall events or periods of elevated groundwater. Mobilisation of mobilised contamination to surface waters Vertical percolation of contamination from soil to groundwater, migration to surface water	Increased risk during construction period due to disturbance of soils with the potential to impact groundwater Reduction of long-term risk as less soil will be exposed

Sources and Contaminants	Sensitive Receptor	Pathway			Qualitative Risk Change (associated with proposed development)
		Current Land Use	Construction Land Use	Proposed Future Land Use	
	Terrestrial ecosystems	Ingestion of contaminated soils and subsequent bioaccumulation	Potential for increased contact with contaminants bound to the soil matrix, resulting from uncovering of soil during construction works	Ingestion of contaminated soils and subsequent bioaccumulation	<p>Increased risk during construction period due to disturbance of soils</p> <p>Reduction of long-term risk resulting from reduction of space for terrestrial ecosystems resulting in lower long-term exposure</p>
Contaminants in groundwater: <ul style="list-style-type: none"> • PFAS • Hydrocarbons (TRH, BTEXN, PAH) • PCBs • Metals • VOC/SVOC • Pesticides • Cyanide • Ammonia • Phosphorous • Phenols 	Precinct/ construction/ operations/ maintenance workers	Incidental contact with groundwater during maintenance activities	Increase in exposure potential during excavation works and construction activities	Incidental contact with groundwater during operation and/or maintenance activities	<p>Increased risk during construction period</p> <p>Unchanged or reduced long-term risk</p>
	Aquatic ecosystems	<p>Exposure to contaminated groundwater</p> <p>Migration during rainfall events or periods of elevated groundwater</p>	<p>Exposure to contaminated groundwater</p> <p>Increased mobilisation of contamination due to dewatering/surface etc.</p>	<p>Exposure to contaminated groundwater</p> <p>Migration during rainfall events or periods of elevated groundwater</p>	<p>Increased risk associated with construction works</p> <p>Unchanged or marginally increased long-term risk due to potential groundwater level changes as a result of changes to contours and construction atop currently unoccupied ground</p>
	Adjacent land use (i.e. residential and/or arable land use)	<p>Exposure to contaminated groundwater</p> <p>Migration during rainfall events or periods of elevated groundwater</p>	<p>Exposure to contaminated groundwater</p> <p>Increased mobilisation of contamination due to dewatering/surface etc.</p>	<p>Exposure to contaminated groundwater</p> <p>Migration during rainfall events or periods of elevated groundwater</p>	<p>Increased risk during construction period</p> <p>Unchanged or marginally increased long-term risk due to potential groundwater level changes as a result of changes to contours and</p>

Sources and Contaminants	Sensitive Receptor	Pathway			Qualitative Risk Change (associated with proposed development)
		Current Land Use	Construction Land Use	Proposed Future Land Use	
					construction atop currently unoccupied ground
Contaminants in surface water and sediments: <ul style="list-style-type: none"> • PFAS • Hydrocarbons (TRH, BTEXN, PAH) • PCBs • Metals • VOC/SVOC • Pesticides • Cyanide • Ammonia, • Phosphorous • Phenols 	Precinct/ construction/ operations / maintenance workers	Incidental contact with sediments or surface water during maintenance activities	Incidental contact during construction. Increased exposure risk when working around drainage lines	Incidental contact with sediments or surface water during operations and/or maintenance activities	Increased risk associated with construction works Reduction of long-term risk resulting from stormwater management infrastructure
	General public	Contact with downstream waters potentially impacted by contaminants from the Site Consumption of impacted aquatic organisms	Contact with downstream waters potentially impacted by contaminants from Site Consumption of impacted aquatic organisms	Contact with downstream waters potentially impacted by contaminants from the Site Consumption of impacted aquatic organisms	Increased risk associated with construction works Reduction of long-term risk resulting from stormwater management infrastructure
	Aquatic ecosystems	Exposure of aquatic ecosystems to contaminated surface water and/or sediments	Contaminants bound to the sediment matrix have increased potential for mobilisation to surface waters during construction	Exposure of aquatic ecosystems to contaminated surface water and/or sediments	Increased risk associated with construction works Reduction of long-term risk resulting from stormwater management infrastructure

4.5.4 Field Assessment and Sampling

Sampling Design and Methodology

Soil samples are needed to assess the background/baseline contaminated land risks of the proposed ARRC precinct and the necessary controls to be implemented during construction activities. Sampling locations were strategically targeted to represent the northern and southern precincts of the site, to cover a broad extent while also focusing on key areas of proposed works. These locations were selected to provide a representative understanding of the site's conditions, acknowledging that further investigation may be required if contamination is identified. By determining CoPC concentrations at the site and comparing these results against the selected investigation levels, a potential risk rating for human health and the environment due to contaminants (if present) could be established. Groundwater samples were collected as part of a separate hydrogeological study. Limited hydrogeochemical parameters were assessed as part of this assessment.

The investigation included the following tasks:

- Advancement of 16 boreholes to a maximum depth of 6.0 m bgl or refusal.
- Logging of soil in general accordance with Australian Standard AS1726:2017, recording presence of fill, as well as visual and olfactory evidence of contamination.
- Field screening of soils for presence of volatile hydrocarbons utilising a photoionisation detector (PID).
- Collection of primary and QA/QC samples in accordance with Section 0.
- Submission of samples to NATA accredited laboratories.

Prior to ground disturbance, all investigation locations were checked for the presence of underground services by an experienced service locator and cross checked Before You Dig Australia plans. Non-destructive drilling (NDD) was used to clear the boreholes to a depth of 1.5 m bgl or until had auger refusal to confirm clearance of subsurface infrastructure prior to commencement. Boreholes were further advanced using a track mounted drill rig using push-tube to the target depth of 6.0 m or push-tube refusal. Soils encountered were described in a bore log with descriptions of the soil characteristics such as texture, moisture, evidence of environmental impacts etc, recorded for each sample location. Soil samples were also screened using a calibrated PID to assess whether VOCs were present.

Soil samples were collected directly from disposable push tube samplers or hand augers in the top 1.5 m bgl using disposable nitrile gloves and a trowel. Disposable nitrile gloves were changed between sampling locations and soil horizons and the trowel was decontaminated between locations/samples. All samples collected were placed in dedicated laboratory supplied containers and/or bags. Soil samples were collected at surface (approximately 0.2 m bgl, 0.5 m bgl, 1.0 m bgl) and 1 m intervals thereafter, to the maximum depth of the investigation 6 m bgl or until refusal.

Select samples at a range of depths were selected for analysis for PFAS, metals (arsenic, cadmium, chromium, copper, mercury, nickel, iron and zinc), hydrocarbons (TRH C6-40, BTEXN and PAHs), OCPs and OPPs, PCBs, cyanide, phosphorous, ammonia and asbestos. Additional analysis for Australian Standard Leaching Procedure (ASLP), Toxicity Characteristic Leaching Procedure (TCLP) and PFAS Total oxidisable precursor assay (TOPA) was requested for select samples based on preliminary sample results.

As part of a separate investigation, sampling of groundwater was undertaken outside of the scope of these works. An interface probe was used to measure the water level and well depth. Prior to sampling, water quality measurements were recorded using a water quality meter. Sampling was undertaken using a low flow peristaltic pump and bladder pump using dedicated HDPE tubing (PFAS-free). Peristaltic pumps are effective to a maximum depth to water of 8 m bgl. To ensure that representative groundwater samples were collected, purged groundwater was passed through a flow-through cell connected to a water quality meter (YSI pro plus). Groundwater was purged until field parameters (pH, electrical conductivity (EC), dissolved oxygen (DO), redox potential and temperature) and water level had stabilised. Samples were analysed for the below analytes:

- Chlorophyll a
- Sample quality parameters (pH, EC, turbidity, major anions and cations, DO, dissolved reactive phosphorous, total suspended solids (TSS), total dissolved solids (TDS), nitrate and nitrite)
- Dissolved metals and total metals (Al, Fe, Mn, Mo, Se, As, Cd, Cr, Cu, Ni, Pb, Zn, Hg)
- Dissolved and total hexavalent chromium and trivalent chromium
- Chemical oxygen demand, total nitrogen, ammonia and phosphorous
- Thermotolerant coliforms and E. Coli

Assessment criteria have been selected in accordance with NEPM (2013) and with reference to the Environmental Protection (Water and Wetland Biodiversity) Policy 2019. Soil criteria have been selected from the NEPM (2013) and NEMP 3.0 (2025) based on the land uses within the northern and southern precincts.

4.5.5 Findings and Discussion of Results

Field Observations

Pertinent information observed by field scientists/engineers is summarised below:

- Most locations are sited within remnant/ regrowth forest had sandy topsoils with leaf litter. Locations located within the void quarry sites were surfaced with gravelly sandy fill.
- Some general waste was observed at the surface throughout the southern site including tyres, cables, old household items and tarps.
- No visual or olfactory evidence of hydrocarbon contamination was identified by the field scientists/engineers such as sheens or odours.
- No visual evidence of acid sulfate soils, e.g., waterlogged soils, organic odours, were identified by the field engineer during the investigation.
- PID readings were recorded between 0.1 ppm and 15.5 ppm – these are low concentrations and were not associated with any odours or staining / sheens and unlikely to be representative of volatile organic compounds.
- No visual evidence of asbestos containing soils were observed.

Laboratory Results

Arsenic, chromium, copper, lead, nickel and zinc were detected above LOR across all depth intervals. No results returned concentrations above the nominated assessment criteria.

TRH concentrations were detected in the two samples collected from Lot 4RP110743 of the northern precinct. No exceedances of F2 (>C10 to C16) were noted in the analysis.

PFAS concentrations were detected in one sample above LOR. Analytical results from this one sample indicated detections of PFOS (0.004 ug/L), sum of PFHxS and PFOS (0.004 mg/kg), and Sum of PFAS (0.004 mg/kg). The observed concentration is in exceedance of the PFOS interim ecological indirect exposure guidance – all land uses included in NEMP V3 (March 2025)

Subsequent additional TCLP, ASLP, and TOPA analysis was undertaken on select samples. The leachate results were compared to the water assessment criteria to indicate the potential human health and/or ecological impacts that may arise from leaching of PFAS from the soils into groundwater and potentially surface water. The ASLP leachate PFAS concentrations was generally slightly higher than the TCLP concentrations. Both samples exceeded the nominated guideline value noting that the assessment is considered a conservative indicator of potential environmental availability. The ASLP may tend to give conservative results as the procedure is an aggressive process of leaching and rolling designed to measure total mobile contaminant concentrations in a soil; therefore, actual PFAS leachate concentrations and rates from the soils are unlikely to be as high as indicated by the ASLP testing. TCLP analytical results indicated detections of PFOS (0.0006 ug/L), sum of PFHxS and PFOS (0.0006 ug/L) and MeFOSSA (0.003 ug/L). An indicative comparison of the TCLP result against the relevant NEMP criteria indicated an exceedance of the 99% Eco Fresh Water criteria. Analytical results indicated detections of PFOS (0.006 ug/L), PFTrDA (0.002 ug/L), MeFOSSA (0.003 ug/L), sum of PFHxS and PFOS (0.006 ug/L) and sum of PFAS (0.011 ug/L). All remaining PFAS compounds were below LOR. An indicative comparison of the ASLP result against the relevant NEMP criteria indicated an exceedance of the 99% Eco Fresh Water criteria. For TOPA, no notable change of concentrations was observed.

Results indicated that no asbestos fibres were detected in samples analysed. No ACM was identified in soil during field sampling. With the exception of phosphorous (as P) and dieldrin, all remaining analytes were below the relevant laboratory LOR. Phosphorous was detected in all samples analysed, however these concentrations are likely attributable to the background geochemistry of the site. Dieldrin was detected in one sample only.

Comparison of Analytical Results with Assessment Criteria

Soils

- No concentrations of applicable analytes were observed exceeding the relevant human health assessment criteria.
- PFAS concentrations were detected above the laboratory LOR in the Northern Precinct hand auger sample at 0.1 m bgl, however no adopted assessment criteria for human health and or ecological were exceeded.
- TCLP and ASLP indicated the potential for PFOS availability in exceedance of the NEMP 2.0 99% Eco Fresh Water Criteria in two samples. No concentrations exceeded the 95% Eco Fresh Criteria.

In summary, no concentrations exceeded the adopted assessment criteria. A plausible available PFOS concentration in excess of the 99% species protection value is present. The likelihood of material or significant environmental harm occurring as a consequence of leachable PFAS from the one sample is very low and as such material excavated may be reused on site in accordance with NEMP v2 provisions.

Groundwater

Metals concentrations at various groundwater monitoring locations across both the Northern and Southern Precinct exceeded the ANZG 95% freshwater and NEPM (2013) freshwater assessment criteria including:

- Dissolved metals: aluminium, cadmium, chromium (hexavalent), copper, manganese, nickel and zinc.
- Total metals: Aluminium, cadmium, chromium (hexavalent), copper, lead, manganese, nickel and zinc.

The exceedances in pH, sulphate, manganese, aluminium, nickel, and zinc can be attributed to elevated ambient background concentrations due to the underlying geology. Groundwater monitoring in both the northern and southern precincts identified exceedances of ANZECC 95% freshwater, NEPM (2013) freshwater, NEPM (2013) drinking water and catchment WQOs. Consideration for groundwater management during construction will occur as the ARRC design is further advanced.

4.5.6 Refined Conceptual Site Model

The CSM has been refined based on the findings from the field investigations and laboratory results. The analytical results from the investigation identified PFAS in soil at one location and various metals, and nutrients in groundwater as the main CoPC observed through sampling at the precinct. Soil chemical contaminants including metals, TRH, BTEXN, PAHs, pesticides, cyanide, and phosphorous have been discounted as CoPCs.

No exceedances of the adopted human health exposure criteria have been identified on site to date. As such except for a plausible pollution linkage with offsite groundwater users, no further human health linkages have been identified. This single human health linkage and identified ecological linkages are discussed in the updated CSM. Based on a review of available information, the key sources of contamination comprise the migration of contaminants from adjacent offsite land use, such as landfill, historic farming and quarrying practices. The updated CSM is presented in Table 39.

Table 39 Updated CSM with potential sources, sensitive receptors, pathways, and associated risk with past, proposed and future land use, based on the findings of the site investigations

Sources and Contaminants	Transport Mechanism	Route of Exposure	Potential Receptor	Potential Complete Pathway	Potential Risk	Comments
PFAS Source: impacted soils on site	Leaching from soil to aquifer systems	Vertical and lateral migration through soil profile	Groundwater	Yes	Low	Leachate testing on samples two indicate that PFAS in the soil on-site is leachable. PFAS concentration exists in soil and is unknown in groundwater/surface water and sediment.
	Migration to surface water features	Overland flow, vertical and lateral migration along surface soils and within drainage system, deposition of sediment	Receiving surface water features	Yes	Low (very low post construction)	The ground across the site is mostly exposed soil and grass and some gravelled areas (no hardstand). Leachate testing indicates that PFAS where present has the potential to be environmentally available and migrate laterally across and from the site to downgradient receptors such as the drain along the northern boundary. Whilst a plausible linkage is present, post development ground coverage (hardstands / buildings / constructed drainage channels) will likely mitigate this plausible pathway.
	Flora/Fauna	Uptake by ecological receptors	Receiving surface water and/or terrestrial ecosystems	Yes	Low to moderate	The ground across the site is mostly exposed soil and grass and some gravelled areas (no hardstand). Surface soil is known to have concentrations of PFAS above the NEMP V3 ecological indirect exposure guidance for any

Sources and Contaminants	Transport Mechanism	Route of Exposure	Potential Receptor	Potential Complete Pathway	Potential Risk	Comments
						land use at one location (2 depths). Although widespread PFAS in shallow soils has not been identified there is a plausible potential for bioaccumulation hazard within terrestrial / semi aquatic organisms. Whilst a plausible linkage is present, post development ground coverage (hardstands / buildings / constructed drainage channels) will likely mitigate this pathway
PFAS Source: Impacted waters at the site	Lateral migration through the aquifer	Discharge to receiving surface water features	Receiving aquatic ecosystems	Yes	Potentially incomplete pathway – if realised Low risk	Limited connection potential exists to surface water features, as such a low risk of groundwater / surface water interaction is present.
	Uptake by ecological receptors interacting with surface water on site	Bioaccumulation/ magnification through the food chain	Semi aquatic/or terrestrial ecosystems	Yes	Low	There is the potential for interaction with semi-aquatic and terrestrial ecosystems to utilise the water within Stapylton Dam. PFAS analysis has not been undertaken of the recycled water and therefore a plausible risk of PFAS presence and potential for bioaccumulation / biomagnification to occur has been identified. The contents of the dam will be removed prior to development and as such the plausible source would effectively be removed hence rendering the

Sources and Contaminants	Transport Mechanism	Route of Exposure	Potential Receptor	Potential Complete Pathway	Potential Risk	Comments
						potential pollution linkage incomplete.
	Vertical migration of surface water to groundwater	Infiltration through base of Stapylton dam	groundwater	Yes	Moderate (pending chemical classification)	The hydrogeological model has confirmed a vertical hydraulic gradient between the Stapylton recycled water dam and the aquifer. Given the dam received recycled water from the Beenleigh STP, it comprises a plausible source of PFAS contamination. Chemical characterisation is required to verify the plausible source pathway receptor linkage.
Hydrocarbons (TRH, BTEXN, PAH), PCBs, Metals, VOC/SVOC, Pesticides, Cyanide, Ammonia, Phosphorous, Phenols Source: Impacted soils on site	Direct contact of vegetation with soil	Absorption of contaminant into roots	On-site vegetation	No	N/A	Minor TRH was observed in two locations within the Northern Precinct. No TRH & BTEXN concentrations exceed the human health and/or ecological criteria.
	Vertical & lateral migration through soil profile	Leaching from soils to groundwater	Regional aquifer system	No	Very Low	Minor concentration of CoPCs were detected within the soil profile whilst present these do not present a risk to the environment or proposed development.
	Migration to surface water features	Migration to surface water features Overland flow, vertical and lateral migration along surface soils and within drainage	Receiving surface water and/or terrestrial ecosystems	No	Very Low	Minor concentration of CoPCs were detected within the soil profile whilst present these do not present a risk to the environment or proposed development.

Sources and Contaminants	Transport Mechanism	Route of Exposure	Potential Receptor	Potential Complete Pathway	Potential Risk	Comments
		systems, deposition of dust				
Hydrocarbons (TRH, BTEXN, PAH), PCBs, Metals, VOC/SVOC, Pesticides, Cyanide, Ammonia, Phosphorous, Phenols Source: Impacted groundwater underlying the site	No analysis has been undertaken onsite to confirm baseline levels and therefore the risk is unknown					
Metals, Ammonia, Nitrogen, Sulphide, Fluoride and Phosphorous Source: Impacted groundwater underlying the site	Lateral migration through the aquifer	Discharge to receiving surface water features	Receiving aquatic ecosystems (i.e. Sandy Creek)	Yes	Moderate	<p>The investigation identified multiple heavy metal exceedances across the Site for freshwater 95% toxicant DGVs. Additionally, WQOs were exceeded for nitrogen (total), Phosphorous, Ammonia, Chlorophyll A and pH at multiple locations. It is noted that in its current observed condition that the groundwater would require treatment to achieve the water quality objectives of Gold Coast water courses.</p> <p>The exceedances in pH, sulphate, manganese, aluminium, nickel, and zinc can be attributed to elevated ambient background concentrations due to underlying geology.</p>

4.5.7 Summary and Conclusions

The analytical results reported that the precinct soils are not currently contaminated with respect to human health risks for the proposed development and/or end uses. A single PFAS in soil sample recorded an exceedance of the NEMP ecological indirect criteria for all land uses. The sample was also found to be leachable and potentially environmentally available at concentrations that would exceed the ecological 99% species protection criteria (if realised). Notwithstanding PFAS, remaining soil results indicate a low risk with respect to ecology and environmental receptors associated with the precinct.

Groundwater at both the northern and southern precincts contained exceedances of ANZG 95 % freshwater, NEPM (2013) freshwater, NEPM (2013) drinking water and WQO's, although this may be attributed to some extent to the underlying geology of the area. Consideration to groundwater impacts during construction and future works will be undertaken as the ARRC design progresses and potentially further assessment to support the design may be required.

4.6 Cultural Heritage and Native Title

4.6.1 Indigenous Values and Native Title

The Gold Coast region holds significant indigenous cultural heritage value, despite being extensively developed. There are two native title claimants in the Gold Coast region:

- Danggan Balun (Five Rivers) People
- Gold Coast Native Title Group

Database Searches and Desktop Investigations

A search of the Department of Women, Aboriginal and Torres Strait Islander Partnership and Multiculturalism (DAWTSIPM) database identifies two Aboriginal Parties for the project area:

- Danggan Balun (Five Rivers) People (Lot 2SP171268)
- Gold Coast Native Title Group (Lots 1SP171268, 12SP109916, 36SP222486, 4RP110743, 5RP110743, 6RP110743)

Search results also indicate that there are no registered Aboriginal cultural heritage sites within the northern or southern site lots. Search results show a large number of reported Aboriginal cultural heritage sites (artefact scatters) recorded in 2015 on lot 5SP256149 on the southern side of Sandy Creek, 100 metres from the boundary of lot 36SP222486. The high density of artefact scatters within this limited area suggests there is a high likelihood for the presence of previously unreported or recorded Aboriginal cultural heritage sites within the project area.

Most of the northern site area has been significantly disturbed through quarrying since the 1960s, and the eastern portion of the northern site was previously cleared in the 1970s. Project works occurring within these areas would be consistent with previous disturbance. However, there are some areas within Lots 1SP171268 and 2SP171268 in the northern site that contain remnant vegetation and have never been subject to ground disturbance. Project works occurring in these areas would be inconsistent with previous disturbance.

In the southern site, only a small section in the east has been disturbed through vegetation clearing in the 1970s. Project works occurring within this area would be consistent with previous disturbance.

All other areas within the southern site contain remnant vegetation and have never been subject to ground disturbance. Project works occurring in these areas would be inconsistent with previous disturbance. As such, a Duty of Care Category Assessment determined that Category 4 and Category 5 apply to the ARRC project.

Site Surveys and Investigations

A cultural heritage survey of the southern site lots was completed by Eastern Yugembah Limited in 2004. The survey was conducted for the City for the purpose of a proposed wastewater treatment plant and included lot 12SP109916 and lot 36SP222486 (at the time, the latter was part of lot 35SP109915). Despite restricted ground surface visibility, five Aboriginal cultural heritage sites, comprising three artefact scatters and two isolated artefacts, were recorded during the survey. The artefacts were left onsite. Proximity of the finds to a swamp 150 metres to the north, where a traditional food source (fernroot or Bungwahl) was located, was noted. The sites were not entered onto the DTATSIPCA database. In June 2025, the Gold Coast Native Title Group were engaged to conduct site walkovers and artefact test pitting across both the northern and southern precinct

areas. These investigations are still ongoing and are being managed in accordance with the relevant parties and legislative requirements.

There are no existing known Cultural Heritage Management Plans or other agreements over any part of the project area that are relevant to the project.

4.6.2 Other Heritage

A search of the Queensland Heritage Register was completed and identified no registered sites within or adjacent to the ARRC project area. Similarly, a search of the Local Heritage Register and City Plan Heritage overlay was completed and identified no registered sites within or adjacent to the ARRC project area. No national heritage sites were identified within or adjacent to the ARRC project site on the Australian Heritage Database. The Australasian Underwater Cultural Heritage Database was also consulted for completeness of process and returned no results of registered sites within or adjacent to the project area. Additional databases, including the National Trust of Australia (Queensland) Heritage Register, Queensland WWII Historic Places, Monuments Australia, and Queensland Native Mounted Police Research Database, were also consulted for the project area and returned no results.

4.6.3 Summary and Conclusions

Indigenous and historical heritage desktop assessments, and indigenous heritage site surveys have been completed and are ongoing across the ARRC sites. A risk assessment was completed and is summarised below:

Historic Cultural Heritage: **Low risk** – No further historic heritage assessments or approvals are required. There are no registered or recorded historic cultural heritage within or adjacent to the northern and southern sites.

Notwithstanding, standard precautionary management measures will be included in the construction contract and are likely to include:

- Cultural Heritage Induction
- Cultural Heritage Unexpected Finds Procedure
- Discovery of Human Remains Procedure

Aboriginal Cultural Heritage: **High risk** – Aboriginal Party consultation and further assessment ongoing.

- There are five recorded Aboriginal cultural heritage sites within the southern site, and numerous registered Aboriginal cultural heritage sites within 100 metres of the southern site.
- There is native vegetation and traditional food sources within both the northern and southern sites.
- There are areas within Lots 1SP171268 and 2SP171268 in the northern sites, and all lots in the southern sites that have not been subject to previous significant ground disturbance.

As such, ongoing engagement and surveys are occurring in collaboration with the relevant Aboriginal and native title groups and appropriate agreements and mitigation measures will be developed on completion of this work.

4.7 Air Quality and Odour

4.7.1 Introduction, Scope, and Purpose

The ARRC includes components and facilities that have the potential to impact air quality and emit odour. In order to quantify these impacts and ensure appropriate mitigations, air quality and odour modelling are required to develop baseline air quality and odour levels in the Stapylton area where the ARRC will be developed. Using these baselines, scenarios using assumptions of the types of activities, plant, and emissions that are likely to be emitted by the various facilities in the ARRC are modelled to determine the impact on air quality and odour on top of baseline conditions. The outcomes of these modelling activities are used to inform engineering controls and mitigation measures to be implemented as the ARRC facilities designs progress through detailed design phases. These studies also provide a basis to develop more detailed and stringent modelling and monitoring for both air quality and odour, which will ultimately be used to inform operational licence conditions for each ERA facility once operational.

4.7.2 Odour

Introduction and Approach

The ARRC comprises a number of facilities that are likely to produce odour. Odour produced by the ARRC would add to the cumulative odour impact of existing facilities in the area (including the City's Stapylton Landfill). In order to determine the potential unmitigated odour impact, modelling is required to develop baseline conditions of existing odour, the potential impact of the ARRC facilities that produce odour, the cumulative impact, and to identify aspects of odour-producing facilities that should have engineering controls to reduce the odour impact.

Methodology

Odour impact has been assessed using dispersion modelling, in accordance with the DETSI Guideline "Odour impact assessments from developments" (DETSI Guideline). The investigation includes for the potential odour impact of both the current site operations (existing Stapylton landfill) and future operations (ARRC precincts) at the site on local sensitive receptors in the surrounding community.

The assessment uses odour emission rates from the historical site-specific odour emission data from the Stapylton landfill odour sampling conducted by the Odour Unit (TOU) Pty Ltd in July 2023. Where there have been process units that were not sampled (i.e. existing landfill green waste pad and proposed ARRC precincts), odour emission data has been obtained from ARRC precincts' design reports, sampling from other local sites and Stantec's global emission and contaminant load database with the most representative data adopted. For BMI Group's Stapylton Resource Recovery Facility (SRRF), which has been included as a background odour source in this assessment, odour emission data of Stage 3 in the previous SRRF air quality impact assessment undertaken by Katestone environmental Pty Ltd in February 2017 have been considered.

The potential off-site odour impact has been assessed on a quantitative basis using the CALPUFF atmospheric dispersion model (Version 7.2.1, Level 150618). The model was set up in accordance with the general guidance contained in the DETSI (2024) Guidelines. For the purpose of this assessment, the predicted ground level odour concentrations were compared against the odour impact assessment criteria as outlined in Table 40. The odour impact assessment criterion of 5.0 odour units (ou, default annoyance level at nose response time) has been

considered based on the 2.5 ou criteria for ground-level sources and wake-affected stacks with inclusion of a default peak-to mean ratio of 2:1 and the 0.5 ou criteria for wake-free stacks with inclusion of a default peak-to mean ratio of 10:1 in accordance with the guideline.

Table 40 Odour impact assessment criteria

Authority	Averaging Period	Impact Assessment Criterion (ou)	Assessment Criteria Reference
Queensland DETSI Odour Guideline	1-hour (99.5 th percentile)	5.0	Guideline Odour Impact Assessment from Developments (DETSI, 2024)

The DETSI guidelines provide the following definition of sensitive receptors:

- a) A dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- b) A motel, hotel or hostel; or
- c) A kindergarten, school, university or other educational institution; or
- d) A medical centre or hospital; or
- e) A protected area; or
- f) A public park or gardens; or
- g) A commercial place or part of the place potentially affected

It includes the curtilage of such any place and any place known or likely to become a sensitive place in the future.

The DETSI Guideline specifies an annoyance threshold for odour with the following values:

- 0.5 odour units (ou), 1-hour average, 99.5th percentile for wake-free stacks
- 2.5 ou 1-hour average, 99.5th percentile for ground-level sources and wake affected stacks
- For facilities that do not operate continuously, the 99.5th percentile must be applied to the actual hours of operation.

In order to assess the cumulative impact, emission sources have been multiplied by their Peak to Mean ratio, allowing for an assessment at 5.0 ou at the 1-hour average 99.5th percentile odour concentration (the default annoyance threshold at nose response time as stated in the DETSI guideline). As this is a site with many areas as well as wake-free and wake-affected point sources, a single criterion of 5.0 ou has been adopted.

The DETSI guideline provides the default peak to mean ratios which are 10:1 for wake-free stacks and 2:1 for ground-level sources and/or wake-affected stacks. These ratios should be incorporated when conducting atmospheric dispersion modelling of odour.

It is commonly recognised that dispersion models need to be supplemented to simulate atmospheric dispersion of odours. This is because the instantaneous perception of odours by the human nose typically occurs over a time scale of approximately one second however dispersion model predictions are typically valid for time scales equivalent to minutes to one hour averaging periods. To estimate the effects of concentration fluctuations perceived instantaneously by the human nose, it is possible to multiply dispersion model predictions by a

correction factor called a “peak-to-mean ratio”. The peak to mean ratio is defined as the ratio of peak 1-second average concentrations to mean 1-hour average concentrations. To estimate peak concentrations, this assessment has used the procedures presented in the DETSI Odour Guideline (2024).

Scenarios and Modelling Criteria

Two scenarios have been modelled as part of this odour impact assessment, the current site operations and the proposed scenario as shown below. Both modelled scenarios include the BMI Group’s SRRF as a background odour source.

- Baseline scenario (current existing case): This scenario represents the current operations at the City’s existing Stapylton landfill site, including covered/stored areas, active tip face and green waste pad.
- Proposed scenario (future case): This scenario represents the proposed ARRC precincts, including the new MRF and residual WtE, as well as the covered areas of the Stapylton landfill that will still emit a small amount of odour despite no longer being in operation. Whilst the new hydrogen refuelling station will also be included in this scenario, it is not considered to have any odorous emissions. Similarly, the new cells provided as part of the proposed upgrade are for storage waste ash which is not considered odorous.
- There is no site-specific sampled data for the residual WtE facility as these are new systems. As such, the new residual WtE odour emissions data is derived based on its current concept design report (as available at the time of this odour impact assessment).

The odour emissions data considered for all modelled odour sources is summarised in Table 41 below.

Table 41 Odour emission data used for the assessment

Source Description	Odour Concentration (ou)	SOER (ou.m/s)	Notes
Existing Stapylton Landfill			
Covered/stored area	-	0.03	Average stored materials SOER from historical sampled data (Stapylton landfill odour sampling conducted by TOU Pty Ltd in July 2023)
Cell 7 and 8	-	0.03	
Active tip face	-	0.79	SOER from historical sampled data (Stapylton landfill odour sampling conducted by TOU Pty Ltd in July 2023)
Green waste pad	-	0.06	Average old and new green waste SOER from similar landfill site operating under the City
New Residual WtE Facility (ARRC Northern Precinct)			
Stack (one stack with two flues in for two boilers) ¹	2,500	-	Data reference: Stantec contaminant database for flares and co-generation facilities.

Source Description	Odour Concentration (ou)	SOER (ou.m/s)	Notes
Reception and Processing Hall (fugitive emissions) ²	1,260	-	Data reference: Site measurements from active tip face at Stapylton landfill.
MRF (ARRC Northern Precinct)			
MRF building ³	239	-	Data reference: Site measurements from active tip face at Reedy Creek landfill (measurements taken at a time when the landfill was not processing putrescible waste).
Ventilation fan on MRF building ³	239	-	
BMI Group's SRRF Stage 3 (Background Odour Source)			
Active tip face - daytime	-	7.06	Data reference: SRRF air quality impact assessment report by Katestone (Final revision, 24 th February 2017) in Appendix B
Active tip face - nighttime	-	0.35	
Day cover	-	0.35	
Intermediate cover	-	0.10	
Final cover	-	0.05	
Compost	-	2.00	
Flare	8.76	-	
Gas engine stacks	474.85	-	

1 – The air discharging from the stack will have been combusted and then further processed through the flue gas treatment facility which is intended to remove ash and other odorous material. The 2,500 ou estimate for the stack assumes that the gas treatment facility is only removing particulates and not treating any odorous substances. It has therefore been modelled conservatively as having similar odour levels to flares or cogeneration systems at other City assets.

2 – The reception and processing hall will have doors that are normally closed. The hall will normally be operating under a negative pressure as the combustion boilers will draw air in from the hall. At the Stapylton ARRC, there will be two boilers reducing the risk of the hall losing negative pressure and odour capture. Nevertheless, fugitive emissions from the hall have been allowed for in the model, assuming slow air movement out of an open door. Therefore, an open door of 5m x 5m has been included in the model as a volume source with a low wind velocity (as per other odour impact assessments from similar systems). The odour used for this fugitive emission is the same as what was measured in the active tip face of the Stapylton landfill.

3 – The new MRF building has been modelled considering a 5m x 5m door as a volume source with a low wind velocity (as per other odour impact assessments from similar systems). The building has also been modelled assuming four ventilation fans installed on the roof. The ventilation fans are assumed to be of Model EF 500M ATEX (single-phase). Each fan has a diameter of 561 mm and a maximum extraction capacity of 7,200 m³/h giving a total extraction of 12 air changes per hour from an assumed building of 10 m x 40 m x 6 m. The odour used for these emissions (through door and fans) is the same as what was measured in the active tip face of the Reedy Creek landfill taken at a time when the landfill did not process putrescible waste.

Meteorological Model Methodology

Three-dimensional (3D) meteorological modelling for a full year of hourly meteorology has been conducted at the Stapylton ARRC. Hourly meteorological data from nearby Brisbane Airport as well as five other meteorological stations have been captured and refined for input into the CALMET meteorological model. In addition to the surface meteorological stations, a single vertical profile at the location of the ARRC was extracted from the gridded 3D output of TAPM (The Air Pollution Model, CSIRO) which was used to develop the

upper air temperature and wind field. The output of the CALMET model, gridded 3D meteorology was used as input into CALPUFF, an advanced Lagrangian puff dispersion model.

Dispersion Modelling

To conduct the dispersion modelling, receptors of odour needed to be identified. In total 7,128 discrete receptors were developed for the ARRC. This included:

- 111 discrete receptors as detailed in Table 42 and Figure 28
- 3,498 receptors were spaced every 40 m over an area of 2.5 km² centred over the ARRC
- 1,158 receptors were spaced at 75 m over an area of 3.5 km² centred over the ARRC
- 937 receptors were spaced at 150 m over an area of 5.8 km² centred over the ARRC
- 1,024 receptors were spaced at 250 m over an area of 9.9 km² centre over the ARRC

Modelling also considered building downwash for each building where odour generation was expected.

Table 42 Discrete residential and commercial/industrial receptors

No.	ID	X (km)	Y (km)	Base Elevation (m)	Description	Type	Sensitive Receptor (Yes/No)
1	W-0	524.2430	6931.9810	42.60	Stapylton Landfill Facility	Industrial	No
2	I-1	523.3710	6931.9680	17.37	Manufacturing or distribution: 205-SP316171	Industrial	No
3	I-2	524.4040	6932.9870	29.35	Directhit Trenchless	Industrial	No
4	E-3	522.9310	6933.3420	6.30	Albert River	Ecological	No
5	R-4	525.7580	6929.0317	2.50	Residential area: Goldmine Rd	Residential	Yes
6	I-5	523.9430	6931.2680	11.49	Pezzimenti Tunnelbore	Industrial	No
7	W-6	523.9340	6932.4620	20.29	JJs Waste and Recycling	Industrial	No
8	I-7	524.0600	6931.0210	10.94	Pro-Pac Packaging	Industrial	No
9	I-8	526.0090	6932.8570	3.13	Unknown: excavation	Industrial	No
10	I-9	523.3430	6931.6590	23.54	Accensi Plant Nutrition Manufacturing	Industrial	No
11	I-10	523.3700	6931.6110	20.88	Amgrow	Industrial	No
12	I-11	524.1660	6932.9610	29.59	Eco Centre Storage	Industrial	No
13	E-12	526.3280	6930.7230	0.96	Sandy Creek	Ecological	No
14	I-13	523.7180	6932.4660	21.84	Guilders Transport and Logistics	Industrial	No

No.	ID	X (km)	Y (km)	Base Elevation (m)	Description	Type	Sensitive Receptor (Yes/No)
15	I-14	524.2070	6931.0630	9.80	ACC Higgins	Industrial	No
16	I-15	523.7400	6932.5930	21.18	AMFS Australasia	Industrial	No
17	C-16	524.0310	6933.0430	20.41	Just Cremate Me - Home Mortuary Support Services	Commercial	Yes
18	I-17	524.6900	6930.6280	9.03	Carroll Engineering Services	Industrial	No
19	A-18	524.1570	6932.3900	19.17	AWLQ Beenleigh Animal Rehoming Centre	Agricultural / Farmland	No
20	W-19	525.3320	6930.7280	5.37	Lee's Environmental Waste Management Services	Industrial	No
21	I-20	524.1620	6932.9250	30.31	Anika Natural Products	Industrial	No
22	A-21	524.1350	6932.3960	20.25	Stapylton City Pound	Agricultural / Farmland	No
23	Q-22	525.1180	6931.9080	18.01	Boral Concrete	Industrial	No
24	I-23	524.8910	6933.3900	7.43	Visy Board Stapylton	Industrial	No
25	Q-24	525.1990	6931.8530	15.91	Boral Asphalt	Industrial	No
26	Q-25	525.3150	6931.8650	12.10	BMI Group - Stapylton Resource Recovery	Industrial	No
27	I-26	525.4230	6931.9880	5.47	ABI Coating Specialists	Industrial	No
28	I-27	525.3490	6931.9810	6.67	The Car Workshop	Industrial	No
29	I-28	525.3450	6932.0770	4.20	Westlink Petroleum	Industrial	No
30	I-29	525.3640	6932.2460	2.42	Penske Australia	Industrial	No
31	I-30	525.3600	6932.1870	2.56	Manufacturing/ Industry: Rossmanns Rd 2	Industrial	No
32	I-31	525.2190	6932.1120	5.52	Manufacturing/ Industry: Rossmanns Rd 1	Industrial	No
33	R-32	525.7650	6931.9260	8.16	Residence: 197 Rossmanns Road	Residential	Yes
34	R-33	525.9340	6931.8990	7.32	Residence: 213 Rossmanns Road	Residential	Yes
35	R-34	526.0440	6931.9170	3.74	Residence: 219 Rossmanns Road	Residential	Yes

No.	ID	X (km)	Y (km)	Base Elevation (m)	Description	Type	Sensitive Receptor (Yes/No)
36	R-35	526.2520	6931.8990	2.08	Residence: 370 Burnside Road	Residential	Yes
37	I-36	526.2880	6931.8370	2.48	A-Plant Plant Hire	Industrial	No
38	A-37	525.5520	6932.1730	2.00	Agriculture: 222-SP101437	Agricultural / Farmland	No
39	A-38	525.8760	6932.1360	2.37	Agriculture: 221-SP101437	Agricultural / Farmland	No
40	A-39	525.2820	6932.5550	2.81	Agriculture: 150-W31134	Agricultural / Farmland	No
41	A-40	525.8520	6932.4290	2.00	Agriculture: SP327762	Agricultural / Farmland	No
42	R-41	525.4420	6932.9070	6.47	Residence: 148 Quinns HillE Road	Residential	Yes
43	R-42	525.8270	6933.1790	3.91	Residence: 181 Quinns HillE Road	Residential	Yes
44	I-43	525.6190	6933.2190	3.76	Ozroll Industries	Industrial	No
45	I-44	525.6580	6933.3160	3.41	Centurion Garage Doors	Industrial	No
46	I-45	525.4810	6933.2260	4.34	Trade Tools Head Office	Industrial	No
47	I-46	525.1040	6933.1250	6.04	Black Diamond Group	Industrial	No
48	I-47	524.9960	6933.0650	8.11	Med-X Healthcare Solutions	Industrial	No
49	A-48	525.1740	6932.9470	8.65	Marland Mushrooms Stapylton	Agricultural / Farmland	No
50	I-49	525.0060	6932.7270	8.96	Holman Industries	Industrial	No
51	I-50	524.9720	6932.8870	10.39	All Brands Toys	Industrial	No
52	I-51	524.8450	6932.8160	15.49	A&L Windows and Doors	Industrial	No
53	I-52	524.8650	6932.9370	11.25	Nu-Pure Beverages	Industrial	No
54	I-53	524.8540	6933.1570	8.78	Visy Board	Industrial	No
55	I-54	524.1950	6933.1360	20.79	Impact Drill and Blast	Industrial	No
56	I-55	524.1480	6933.0560	23.36	Welch Property	Industrial	No

No.	ID	X (km)	Y (km)	Base Elevation (m)	Description	Type	Sensitive Receptor (Yes/No)
57	S-56	524.0970	6933.0860	21.05	School: Little Scholars School of Early Learning	Educational	Yes
58	I-57	524.1200	6932.9490	28.27	PowerCap	Industrial	No
59	I-58	524.1460	6932.9190	29.58	Zero Emissions Developments	Industrial	No
60	I-59	524.1720	6932.8970	30.99	APB Britco	Industrial	No
61	I-60	524.1670	6932.7560	31.58	Beenleigh Truck Parts	Industrial	No
62	I-61	524.1900	6932.7490	31.51	Gold Coast Cyliner Heads	Industrial	No
63	I-62	524.1360	6932.6710	29.56	Just Jap Truck Spares	Industrial	No
64	I-63	524.0600	6932.7010	26.30	Eagle Wrecking	Industrial	No
65	I-64	524.0070	6932.9270	25.05	Industrial: 168 Stapylton - Jacobs Well Road	Industrial	No
66	I-65	523.8150	6932.7190	20.83	Pro-weld	Industrial	No
67	I-66	523.7370	6932.7170	19.58	PVC Fencing Warehouse	Industrial	No
68	I-67	523.6130	6932.7270	15.13	SEQ Landscape Supplies	Industrial	No
69	Rec-68	523.4790	6932.5140	14.50	Recreation: Beenleigh Drive-in	Residential	Yes
70	I-69	523.4390	6932.3140	21.19	Red Horse Transport	Industrial	No
71	I-70	523.3620	6932.1970	15.04	National Tiles	Industrial	No
72	R-71	523.0150	6932.0200	28.23	Residences: The Lodge Beenleigh 7 Poplar Crescent	Residential	Yes
73	Q-72	524.4250	6932.5270	39.09	Boral Quarries	Industrial	No
74	I-73	525.7550	6931.2860	3.46	Civilmart	Industrial	No
75	I-74	525.5920	6930.9490	5.52	Industry: 243 Burnside Road	Industrial	No
76	R-75	525.5700	6930.6380	4.45	Residence: 222 Burnside Road	Residential	Yes
77	I-76	524.9940	6930.7270	3.27	Multinail Australia	Industrial	No

No.	ID	X (km)	Y (km)	Base Elevation (m)	Description	Type	Sensitive Receptor (Yes/No)
78	I-77	524.3520	6930.5950	9.93	Austspray Environmental Weed Control	Industrial	No
79	I-78	523.7540	6930.8830	7.98	Australian Tyre Processors	Industrial	No
80	I-79	523.6820	6930.5150	14.23	Aldi Distribution Warehouse	Industrial	No
81	R-80	526.6270	6931.2620	7.29	Residence: 360 Burnside Road	Residential	Yes
82	R-81	526.5590	6932.3770	2.75	Residence: 26 Jacosa Road	Residential	Yes
83	R-82	526.4690	6933.2570	2.04	Residence: 512 Burnside Road	Residential	Yes
84	R-83	526.4550	6933.8000	3.00	Residential area: Alberton	Residential	Yes
85	H-84	524.8730	6933.7180	10.45	Hotel: The Gem Hotel	Commercial	Yes
86	Q-85	524.2660	6933.6710	36.33	Yellowwood Quarry	Industrial	No
87	R-86	524.5450	6933.0520	21.36	Residence: 42 Quinns Hill Road	Residential	Yes
88	R-87	525.3670	6933.9490	6.47	Residence: 10 Alberton Road	Residential	Yes
89	R-88	523.8170	6933.0150	12.03	Residence: 163 Stapylton - Jacobs Well Road	Residential	Yes
90	R-89	523.9640	6933.1680	18.99	Residence: 29 Quinns Hill Road Stapylton	Residential	Yes
91	C-90	523.9130	6933.1820	18.88	A Direct Cremation Brisbane	Commercial	Yes
92	C-91	523.8130	6933.1320	15.18	NewHaven Funerals and Crematorium	Commercial	Yes
93	R-92	523.9480	6933.2330	23.44	Residence: 22 Quinns Hill Road	Residential	Yes
94	R-93	523.7280	6933.1120	14.76	Residence: 10 Ironbark Ct	Residential	Yes
95	R-94	523.3090	6932.6570	7.07	Residence: 10 Yellowwood Road	Residential	Yes
96	I-95	523.7660	6932.2080	13.14	Manufacturing or distribution: 201-SP316171	Industrial	No

No.	ID	X (km)	Y (km)	Base Elevation (m)	Description	Type	Sensitive Receptor (Yes/No)
97	I-96	523.4080	6931.3940	14.57	Elite Diesel Performance	Industrial	No
98	I-97	523.5580	6931.1790	10.11	Abdri Masonry	Industrial	No
99	R-98	524.1198	6929.1011	8.09	Residential area: Norfolk	Residential	Yes
100	R-99	521.4999	6930.6065	10.56	Residential area: Yatala	Residential	Yes
101	Rec-100	521.5434	6932.1783	5.29	Recreation: Mount Warren Park	Recreational / Park	Yes
102	E-101	524.2270	6934.1230	30.58	Yellowwood Reserve	Ecological	No
103	A-102	525.6150	6934.2120	3.06	Agriculture: 14 Alberton Road Alberton	Agricultural / Farmland	No
104	A-103	526.3140	6933.4760	3.09	Agriculture: 442 Stapylton - Jacobs Well Road	Agricultural / Farmland	No
105	A-104	526.9850	6931.5210	0.77	Agriculture: 364 Burnside Road Gilberton	Agricultural / Farmland	No
106	A-105	526.5100	6930.0380	1.05	Agriculture: 292 Goldmine Road Gilberton	Agricultural / Farmland	No
107	A-106	526.1030	6929.3950	0.34	Agriculture: 276 Goldmine Road Norwell	Agricultural / Farmland	No
108	R-107	523.5024	6933.4675	17.40	Yellowwood Residential area	Residential	Yes
109	E-108	525.0793	6933.9474	9.13	Woolshed Parkland	Ecological	No
110	E-109	525.3121	6932.9579	8.25	Quinns Hill reserve	Ecological	No
111	E-110	525.4993	6931.2022	1.40	Bandicoot Environmental Reserve	Ecological	No

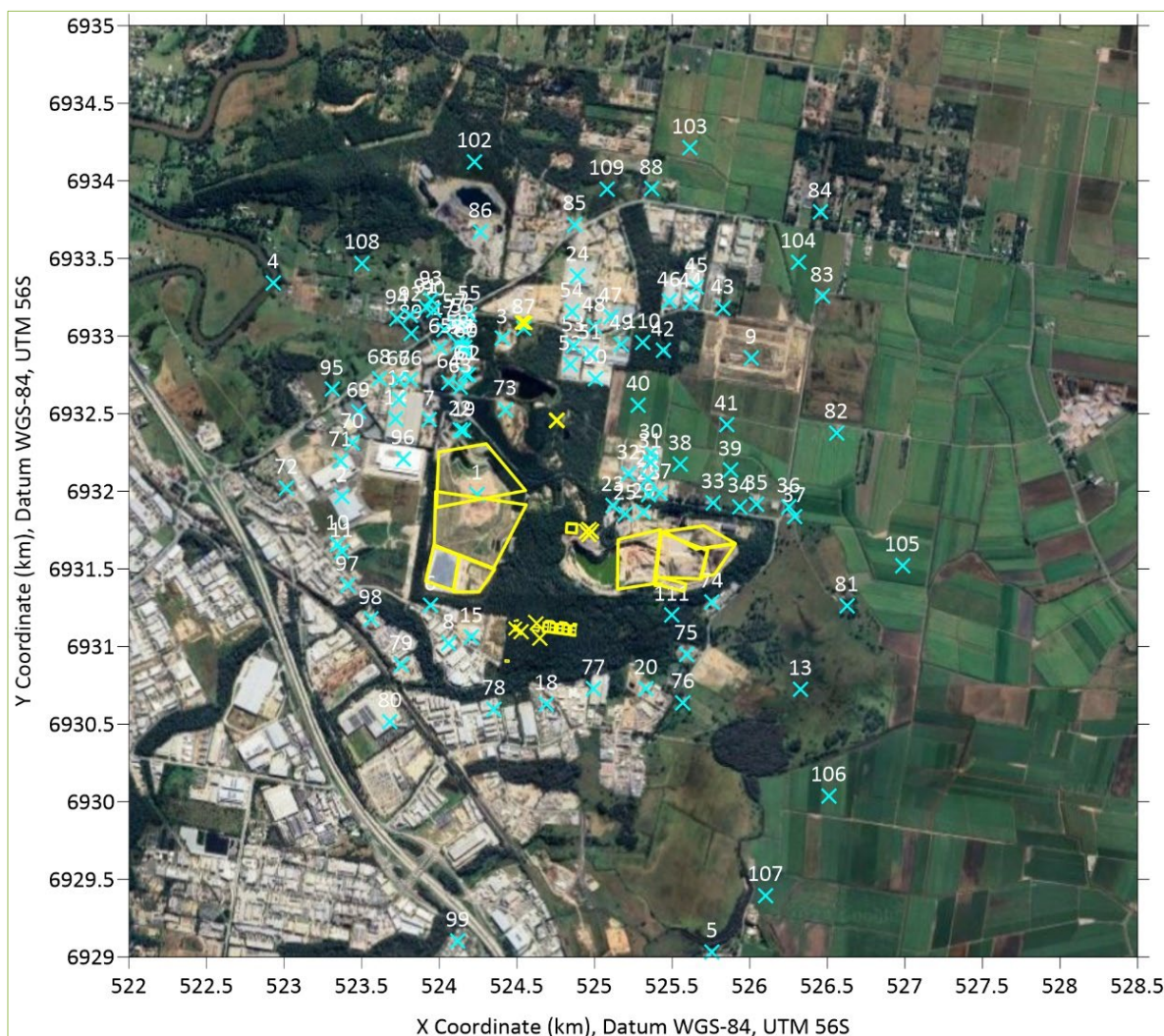


Figure 28 Discrete receptors used in the odour dispersion modelling

Odour Sources

Odour sources are represented in CALPUFF either as area, point or volume sources. The characteristics of each source type are outlined briefly below.

Area sources are usually low-lying odour emission sources such as tanks, ponds and stockpiles, where ambient conditions of wind and temperature determine the rate of odour emission from the source. The modelled emission rate is a surface odour emission rate (SOER) which is an odour flux rate per unit area, in $\text{ou.m}^3/\text{m}^2/\text{s}$. Note this is the same as $\text{ou.m}/\text{s}$ which is the nomenclature adopted in this chapter.

Point sources are odour emission sources such as stacks, where there is a relatively high velocity of air through a relatively small orifice. A wake-affected point source is where the discharge of the point source is within the zone of disturbed air that is created as the wind passes around or over nearby structures such as building or trees. To calculate the odour emission rate for a point source, the specified volumetric air flow rate (m^3/s) is multiplied by the odour concentration (ou). This provides an 'Odour Emission Rate' (OER) in $\text{ou.m}^3/\text{s}$.

Volume sources are commonly modelled to represent fugitive emissions from within a building, for example emissions through doorways or under unsealed building eaves, based on the prevailing meteorological conditions.

Scenario 1: Baseline Conditions

In this scenario, the existing Stapylton landfill site and the BMI Group's SRRF Stage 3 (background odour source) have been modelled as baseline conditions. This scenario does not contain any ARRC or new STP components.

For the existing Stapylton landfill, all odour sources have been included as area sources. The current existing odour sources are comprised of the landfill which consists of covered/storage areas 1 and 2, green waste pad, Cell 7 covered area, Cell 8 covered area and an active tip face. The current existing sources are represented in CALPUFF as area sources as they are ground-based emission sources. The rate of the odour emission is determined by ambient conditions of wind and temperature. The green waste pad receives new residential and commercial green waste on a daily basis. Over a period of four weeks, the green waste is shredded and ages and is eventually moved off site for processing. In this assessment, the green waste pad emission has been modelled conservatively as being constant over time using the odour emission rate for aged green waste.

For the BMI Group's SRRF Stage 3 is the main background odour source which has been included in the modelling. It comprises of an active tip face, day cover, intermediate cover, final cover, composting, biogas flare and three gas engine stacks. The flare and gas engine stacks have been modelled as point sources. All other sources have been modelled as area sources.

Table 43 provides the area sources used for the modelling of Scenario 1, while Table 44 provides the point sources.

Table 43 Area sources modelled in Scenario 1

Source ID	Sources Description	Easting (km)	Northing (km)	Release Height (m)	Area (m ²)	Uncontained SOER (ou.m/s)	Uncontained OER (ou.m ³ /s)	Capture Efficiency (%)	Contained SOER (ou.m/s)	Contained OER (ou.m ³ /s)
Existing Stapylton Landfill										
CSA1	Covered/stored area 1	523.981	6931.896	0.0	154,860.00	0.03	5,213.62	0%	0.03	5,213.62
CSA2	Covered/stored area 2	523.966	6931.654	0.0	179,908.00	0.03	6,056.90	0%	0.03	6,056.90
GW	Green waste pad	524.331	6931.891	0.0	1,425.00	0.06	85.50	0%	0.06	85.50
C7CA	Cell 7 - covered/stored area	523.911	6931.421	0.0	41,567.00	0.03	1,399.42	0%	0.03	1,399.42
C7ATF	Cell 7 - active tip face	523.920	6931.400	0.0	404.00	0.79	319.97	0%	0.79	319.97
C8CA	Cell 8 - covered/stored area	524.090	6931.352	0.0	40,020.00	0.03	1,347.34	0%	0.03	1,347.34
BMI Group's SRRF Stage 3 (Background Odour Source)										
ATFD	Active tip face – daytime ¹	525.391	6931.392	0.00	400.00	7.06	2,824.00	0%	7.06	2,824.00
ATFN	Active tip face – nighttime ¹	525.391	6931.392	0.00	400.00	0.35	140.00	0%	0.35	140.00
DC	Day cover ²	525.390	6931.402	0.00	9,600.00	0.35	3,360.00	65%	0.12	1,176.00
IC1	Intermediate cover 1 ²	525.147	6931.369	0.00	84,408.00	0.10	8,440.80	65%	0.04	2,954.28
IC2	Intermediate cover 2 ²	525.396	6931.447	0.00	72,250.00	0.10	7,225.00	65%	0.04	2,528.75
FC1	Final cover 1	525.654	6931.628	0.00	36,872.00	0.05	1,843.60	0%	0.05	1,843.60
FC2	Final cover 2	525.683	6931.445	0.00	24,283.00	0.05	1,214.15	0%	0.05	1,214.15
CO	Compost	524.817	6931.736	0.00	3,750.00	2.00	7,500.00	0%	2.00	7,500.00

Notes:

1 – Modelled with time variation to consider daytime and nighttime emissions (daytime: 6 am to 6 pm, nighttime: 6 pm to 6 am)

2 – 65% capture efficiency has been applied to consider a gas recovery factor of 65%.

Table 44 Point sources modelled in Scenario 1

Source ID	Sources Description	Easting (km)	Northing (km)	Stack Height (m)	Diameter (m)	Airflow Rate (m ³ /s)	Exit Velocity (m/s)	Odour Concentration (ou)	Exit Temperature (K)	Total OER (ou.m ³ /s)
BMI Group's SRRF Stage 3 (Background Odour Source)										
FS	Flare stack	524.964	6931.755	3.00	1.62	41.22	20.00	8.76	1,273.15	361.00
GES1	Gas engine stack 1	524.947	6931.740	5.00	0.36	1.27	12.46	474.85	783.15	602.00
GES2	Gas engine stack 2	524.964	6931.722	5.00	0.36	1.27	12.46	474.85	783.15	602.00
GES3	Gas engine stack 3	524.983	6931.741	5.00	0.36	1.27	12.46	474.85	783.15	602.00

Scenario 2 – ARRC Proposed Development

In this scenario, the proposed ARRC precinct and the BMI Group's SRRF Stage 3 (background odour source) have been modelled. The existing Stapylton Landfill will no longer be operational in this scenario (other than some small occasions to accept special burials and emergency waste from time to time); however, the covered areas of the landfill will continue to be covered and emit a small amount of odour. As such, covered landfill areas of the existing landfill modelled in Scenario 1 are included in this scenario to consider odour emissions from covered areas.

The proposed future sources include the new MRF and ARRC Residual WtE facility at Stapylton. It should be noted that the hydrogen refuelling station has not been included in the model as it is considered as an insignificant odour source. The new mono-cells are intended to hold air pollution control residue which is considered inert and non-odorous. It has been assumed for the purpose of this assessment that the stack at the new residual WtE facility consists of two flues in one stack. Therefore, these two flues have been modelled as two separate point sources. This was done to remain conservative, as the twin flues are independent of one another, where a single boiler can operate alone. It should be noted that the majority of odour will be removed through combustion; however, there will likely have some odorous combustion products. The flue gas will be treated to remove particulates, which will also remove odour, however a conservative approach has been adopted whereby some residual odour has been assumed in the flues. The boiler will draw foul air from the reception and processing hall. Residual fugitive odour emissions from this hall have been assumed as wafting at low wind speeds from a door that is normally closed but occasionally opened. The MRF building has been included as four-point sources ventilating an assumed MRF building. Residual fugitive odour emissions from the MRF building have been assumed as wafting at low wind speeds from a door that is normally closed but occasionally opened.

No changes have been made to the BMI Group's SRRF Stage 3 emissions compared to Scenario 1.

Area, point, and volume sources used in Scenario 2 modelling have been detailed in Table 45, Table 46, and Table 47.

Table 45 Area sources modelled for Scenario 2

Source ID	Sources Description	Easting (km)	Northing (km)	Release Height (m)	Area (m ²)	Uncontained SOER (ou.m/s)	Uncontained OER (ou.m ³ /s)	Capture Efficiency (%)	Contained SOER (ou.m/s)	Contained OER (ou.m ³ /s)
Existing Stapylton Landfill (only areas that will continue to emit odour)										
CSA1	Covered/stored area 1	523.981	6931.896	0.0	154,860.00	0.03	5,213.62	0%	0.03	5,213.62
CSA2	Covered/stored area 2	523.966	6931.654	0.0	179,908.00	0.03	6,056.90	0%	0.03	6,056.90
C7CA	Cell 7 - covered/stored area	523.911	6931.421	0.0	41,567.00	0.03	1,399.42	0%	0.03	1,399.42
C8CA	Cell 8 - covered/stored area	524.090	6931.352	0.0	40,020.00	0.03	1,347.34	0%	0.03	1,347.34
BMI Group's SRRF Stage 3 (Background Odour Source) – Same as in Scenario 1										

Table 46 Point sources modelled in Scenario 2

Source ID	Source Description	Easting (km)	Northing (km)	Stack Height (m)	Diameter (m)	Airflow Rate (m ³ /s)	Exit Velocity (m/s)	Exit Temperature (K)	Odour Concentration (ou)	Total OER (ou.m ³ /s)
New Stapylton Residual WtE Facility										
BF1	Boiler - Flue 1	524.757	6932.456	80.00	2.58	106.03	20.30	398.15	2,500.00	265,075.00
BF2	Boiler - Flue 2	524.758	6932.457	80.00	2.58	106.03	20.30	398.15	2,500.00	265,075.00
New MRF										
VFAN1	Ventilation fan 1	524.556	6933.085	6.00	0.56	2.00	8.09	298.15	239.00	478.00
VFAN2	Ventilation fan 2	524.547	6933.086	6.00	0.56	2.00	8.09	298.15	239.00	478.00

VFAN3	Ventilation fan 3	524.538	6933.088	6.00	0.56	2.00	8.09	298.15	239.00	478.00
VFAN4	Ventilation fan 4	524.530	6933.090	6.00	0.56	2.00	8.09	298.15	239.00	478.00

Table 47 Volume sources modelled in Scenario 2

Source ID	Source Description	Easting (km)	Northing (km)	Release Height (m)	Initial Sigma Y (m)	Initial Sigma Z (m)	Odour Concentration (ou)	Airflow Rate (m³/s)	Total OER (ou.m³/s)
New Stapylton Residual WtE Facility									
RPH	Reception and processing hall	524.934	6932.366	2.50	2.33	2.33	1,260.00	2.50	3,150.00
New MRF									
MRB	Material Recovery Facility Building	524.565	6933.083	2.50	2.33	2.33	239.00	2.50	597.50

The following assumptions and considerations have been included in this assessment:

General

- The existing Stapylton landfill and BMI SRRF operations have been considered based on the current activities on sites which may change in the future to suit the sites' requirements. Similarly, the new ARRC precinct design is evolving. This assessment considers the design details which were available at the time of completing this assessment. The design details may change in the future as it progresses.
- The modelling has been assessed at a 1-hour averaging period and at the 99.5th percentile limit at ground level. The odour criterion for the cumulative impact of all odour sources at Stapylton ARRC is 5 ou, where a peak-to-mean ratio of 2.0 was applied to all ground-based sources and wake affected stacks a peak-to-mean ratio of 10 was applied to the flues as wake-free stacks.
- Constant emission rates have been assumed for all sources, 24 hours per day every day of the week, except daytime and nighttime active tip face in the BMI Group SRRF which has been included as a time varying source (daytime: 6 am to 6 pm, nighttime: 6 pm to 6 am to reflect the previous modelling completed by Katestone). In reality, odour emissions fluctuate on a day-to-day basis and seasonally. It should be noted that site specific sampling was conducted in July, however, given that the decomposition of waste material is largely stable the odour emission is not expected to be heavily influenced by ambient temperature.
- The model results represent an entire year of hourly varying meteorological conditions for the year 2023.
- No upset conditions have been modelled at this stage.

Existing Stapylton Landfill

- The aged or 'old' waste is not assumed to be anaerobic at the surface where emission occurs, or the impact of the covers and the gas extraction system is such that the residual emissions is low, in line with site measurements. It should be noted that the Stapylton landfill emission rates are based on measured values and tend to be lower than the raw BMI SRRF emission rates. However, when the 'capture rate' has been applied to the BMI SRRF rates, they are similar to those measured at the Stapylton landfill.
- Cell 7 is an area that has only just started to be landfilled at this point in time, however, it is conservatively included in the model as part of the current extent of existing site operation.
- Cell 8 (area to the east of Cell 7) will be developed as a landfill cell in the next couple of years. However, to be conservative, it is assumed that Cell 8 is part of existing site operation and has therefore been included in the model.
- Surface areas have been measured using Google Earth based on provided footprints. These may be larger or smaller than that modelled, but the overall difference is expected to be minor.
- The green waste pad area is open and located on top of the landfill covered area. Green waste is shredded onsite and further processing occurs off site at a third-party provider. It is only stored on site and continually moved off-site. This occurs continually throughout the week. The green waste pad is therefore considered as a continuous odour source in the model.

- The covered landfill area located to the north and Cell 7 (southern area) both have an active tip face, however it has been assumed that only one active tip face will be operational at a time. The southwest corner of Cell 7 has been modelled as the active tip face as the likely worst case for odour impact.
- Release height for all landfill areas has been considered to be at ground level.
- The ground level is highly variable in the overall area, and it is acknowledged that terrain heights are constantly changing. As such, base elevations as per the detailed fine scale input terrain data has been used.

New Residual WtE Facility

- There is one stack with two flues in it. These flues have been modelled as two separate point sources in both this odour impact assessment and the separate air quality assessment.
- As per the new Residual WtE concept design report (September 2024), two new mono cells will be used to store the air pollution control residue (APCr). As the APCr is not considered odorous and has therefore not been included in the model.
- As detailed in the concept design report, the two boilers will be maintained at a very high level ensuring at least one boiler is running all the time, so that the shutdown of the Residual WtE facility does not require waste to be diverted from the plant and disposed of in an alternative receival facility such as landfill. Also, in the event of a boiler failure, the excess waste will be stored in the waste fuel bunker. If the condition of the boiler is such that it cannot be returned to service before the bunker capacity is consumed, the waste will need to be diverted to a temporary holding facility (such as landfill). For the purposed of this modelling, it has been assumed that the temporary holding facility will be at the existing Stapylton landfill site and has therefore already been included as part of the existing scenario. As such it has been assumed that there will be no waste storage in the new mono-cells.
- Waste receival and tipping hall will receive waste which will be continuously processed. This will be an enclosed building. The boilers will be drawing air from the waste receival and tipping hall and waste fuel bunker keeping them continuously under a negative pressure and preventing them from releasing fugitive odour emissions. As there is redundancy in the boiler operation, the case where fugitive emissions occur from the tipping hall and bunker is considered a very low frequency event. Nevertheless, fugitive emissions from the hall have been included to allow for the short times when the hall doors are open and negative pressure is not as high. A 25 m² door has been allowed for, emitting at a rate of 0.1 m/s velocity and with an odour similar to that measured from the Stapylton active tip face.
- The MRF building has been assumed to be a 10 m x 40 m x 6 m building with a 5 m x 5 m access door that is normally closed. It has been assumed that this building will be ventilated at a rate of 12 air changes per hour by four fans. These four fans have been considered as point sources. The location of these fans is considered to be on the top of the building equally distributing from the mid-point of the roof. Whilst the door will normally be closed, fugitive emissions has been allowed for when the door is open, emitting at a rate of 0.1 m/s velocity (similar to the waste receival and tipping hall) and with an odour similar to that measured from the active tip face at Reedy Creek at a time when the landfill was not processing putrescible waste. This building door has been modelled as a volume source with the door location assumed to be in the worst case for odour impact.

- Lagoons will be used to store site stormwater which is not a significant source of odour and has therefore not been included in the model.

BMI SRRF Stage 3 (Background Odour Source):

- This site is owned and operated by BMI Group and has been included in both modelled scenarios as a background odour source.
- The odour emission data from the historical air quality impact assessment completed for this site in February 2017 (by Katestone) has been used. In the 2017 assessment, two proposed operations (Stage 2 and Stage 3) were investigated. For the purpose of this assessment, it is assumed that this site is currently operating as per the worst case operation i.e. Stage 3 operation and has been included as such for both scenarios.
- For day cover and intermediate cover areas, a 65% gas recovery factor was used in the 2017 assessment which has also been used in this assessment.
- The flare stack has been modelled with an exit temperature of 1,273.15 K (i.e. 1,000°C) and an exit velocity of 20 m/s. The flare has been modelled assuming the standard default Briggs plume rise equation which may over predict the plume rise height. Specific treatment of the flare has not been conducted as the contribution of the flare to the total odour emissions is considered a minor source (<0.05%). In future if the contribution of the flare as an odour source increases, more accurate source characteristics of the flare will be necessary including adjustments to the plume rise. In order to ensure emissions from the flue remain conservative. A PtMr of 10 was applied.
- Release height for all landfill areas has been considered to be at ground level.

Model Results

Complaints Record

Since 2020, the City has received odour complaints presumed to be from the existing Stapylton landfill from only one location which is Yatala Drive-In movie theatre, modelled as discrete receptor #69, the Beenleigh Drive-In. It is located approximately 500m from the northwest boundary of the existing landfill as shown in **Error!**

Reference source not found.. Two odour complaints from this location have been recorded by the City along with many verbal complaints that were received from customers at and along Yatala Drive-In area. These complaints were received between January 2020 and May 2023 with no odour complaints received and reported since May 2023.

Odour Impact Results

Table 49 presents the 1-hour, 99.5th percentile odour concentrations at each of the modelled discrete receptors for Scenario 1 and Scenario 2. Figure 29 and Figure 30 present the 1-hour average 99.5th percentile contour isopleth plots for Scenario 1 and Scenario 2, respectively. The 1.0, 2.5 and 5.0, 10.0 and where appropriate, the 50.0 ou odour contour lines are shown on the figures. The DETSI odour criteria for a cumulative assessment is 5 ou.

In Scenario 1, two modelled discrete receptors exceed the assessment criterion on 5.0 ou:

- The highest 1-hour average 99.5th percentile odour concentration of 13.4 ou is predicted at receptor #1 located at the existing Stapylton landfill and is therefore not considered a sensitive receptor.

- The second location above 5.0 ou is receptor #111, the Bandicoot Environmental Reserve with a modelled impact of 5.9 ou. This is a location that is just south of the existing BMI Group SRRF and already lies within the 5 ou impact contour without any known adverse effects. It is not considered a sensitive receptor from an odour point of view.

The odour complaint location (Yatala Drive-In Movie Theatre, receptor #69 as the Beenleigh Drive-In) has a predicted odour impact of 1.0 ou.

In Scenario 2, 15 modelled discrete receptors exceed the assessment criterion of 5.0 ou. These are summarised in Table 48.

Table 48 Odour concentrations at or exceeding the assessment criterion of 5.0 ou in Scenario 2

Receptor No.	Description	Type of Receptor	Sensitive Receptor	Scenario 2
1	Stapylton Landfill Facility	Industrial	No	14.0
8	Pro-Pac Packaging	Industrial	No	5.6
15	ACC Higgins	Industrial	No	8.7
18	Carroll Engineering Services	Industrial	No	8.7
20	Lee's Environmental Waste Management Services	Industrial	No	6.5
23	Boral Concrete	Industrial	No	5.3
25	Boral Asphalt	Industrial	No	6.7
26	BMI Group - Stapylton Resource Recovery	Industrial	No	7.3
27	ABI Coating Specialists	Industrial	No	5.4
28	The Car Workshop	Industrial	No	5.4
33	Residence: 197 Rossmanns Road	Residential	Yes	6.3
34	Residence: 213 Rossmanns Road	Residential	Yes	5.5
74	Civilmart	Industrial	No	5.9
77	Multinail Australia	Industrial	No	12.6
111	Bandicoot Environmental Reserve	Ecological	No	8.3

Two of these discrete receptors are considered sensitive. These are all already located adjacent to the BMI landfill and whilst they are considered sensitive receptors due to them being residential dwellings, the residents are unlikely to be highly sensitive given their current location and being within an industrial amenity area.

Similar to Scenario 1, the odour complaint location (Yatala Drive-In Movie Theatre, receptor #69 as the Beenleigh Drive-In) has a predicted odour impact of 1.7 ou, increased from 1.0 ou in Scenario 1. This increase in odour impact is not considered significant given it is well below the 5 ou criterion.

The nearest residential area located west of the existing Stapylton landfill is not likely to increase significantly (receptor #72 with an increase from 0.7 ou to 1.3 ou) and will not be within the 5 ou assessment criterion contour.

The proposed works, as modelled, include the following odour mitigation measures:

- Providing cover over the disused landfill cells
- Ventilation of the MRF building
- Extraction and treatment of foul air from the receiving and processing hall of the Residual WtE plant through the boilers, and discharge of treated air in the flues

Apart from the two residences (receptors #33 and 34) on Rossmans Rd, the proposed ARRC works, including the above odour mitigation measures, will increase odours at most receptors, yet the increase is unlikely to cause odour nuisance at any of the sensitive receptors modelled.

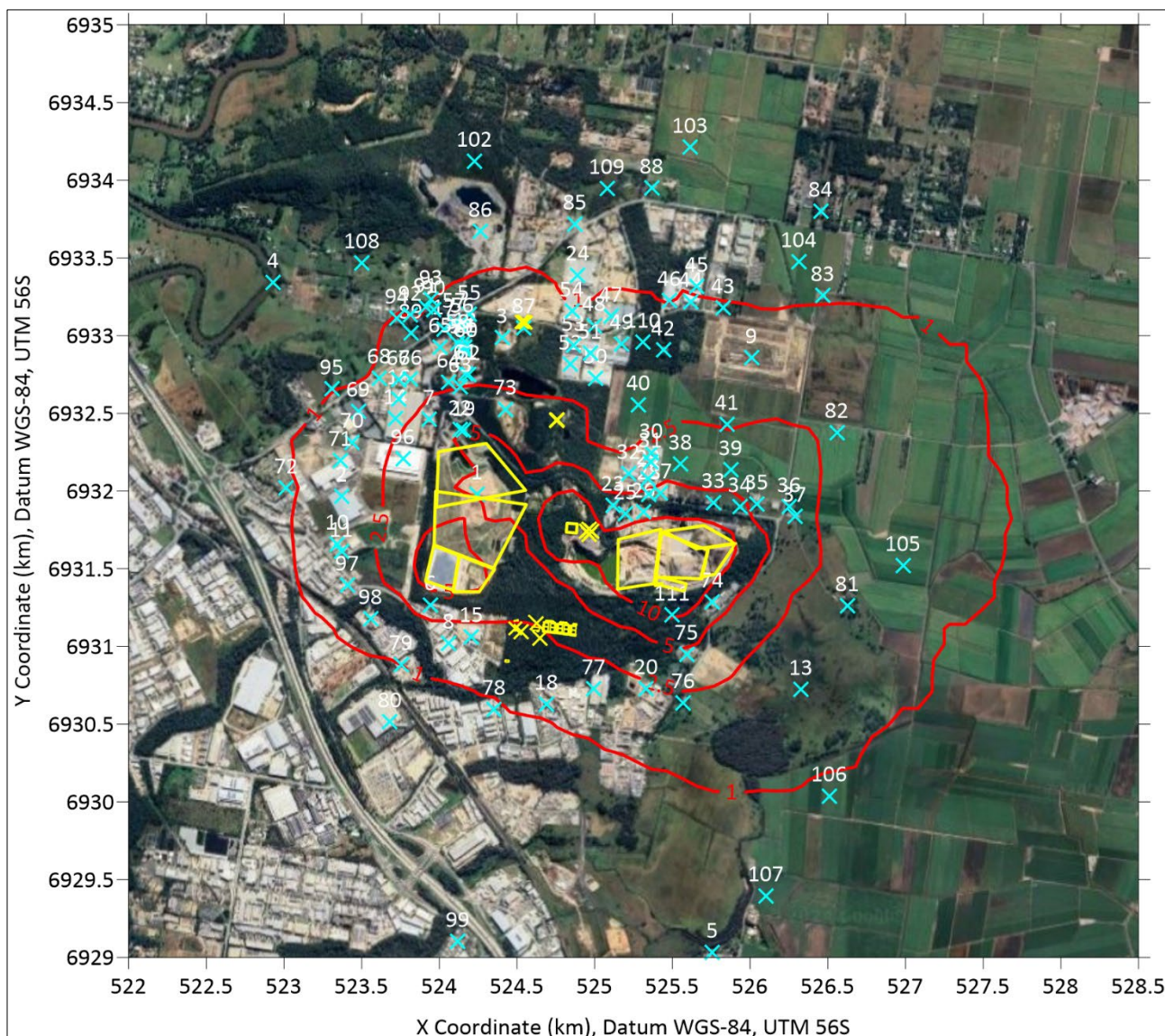


Figure 29 One-hour average 99.5th percentile odour concentration isopleth plot for Scenario 1

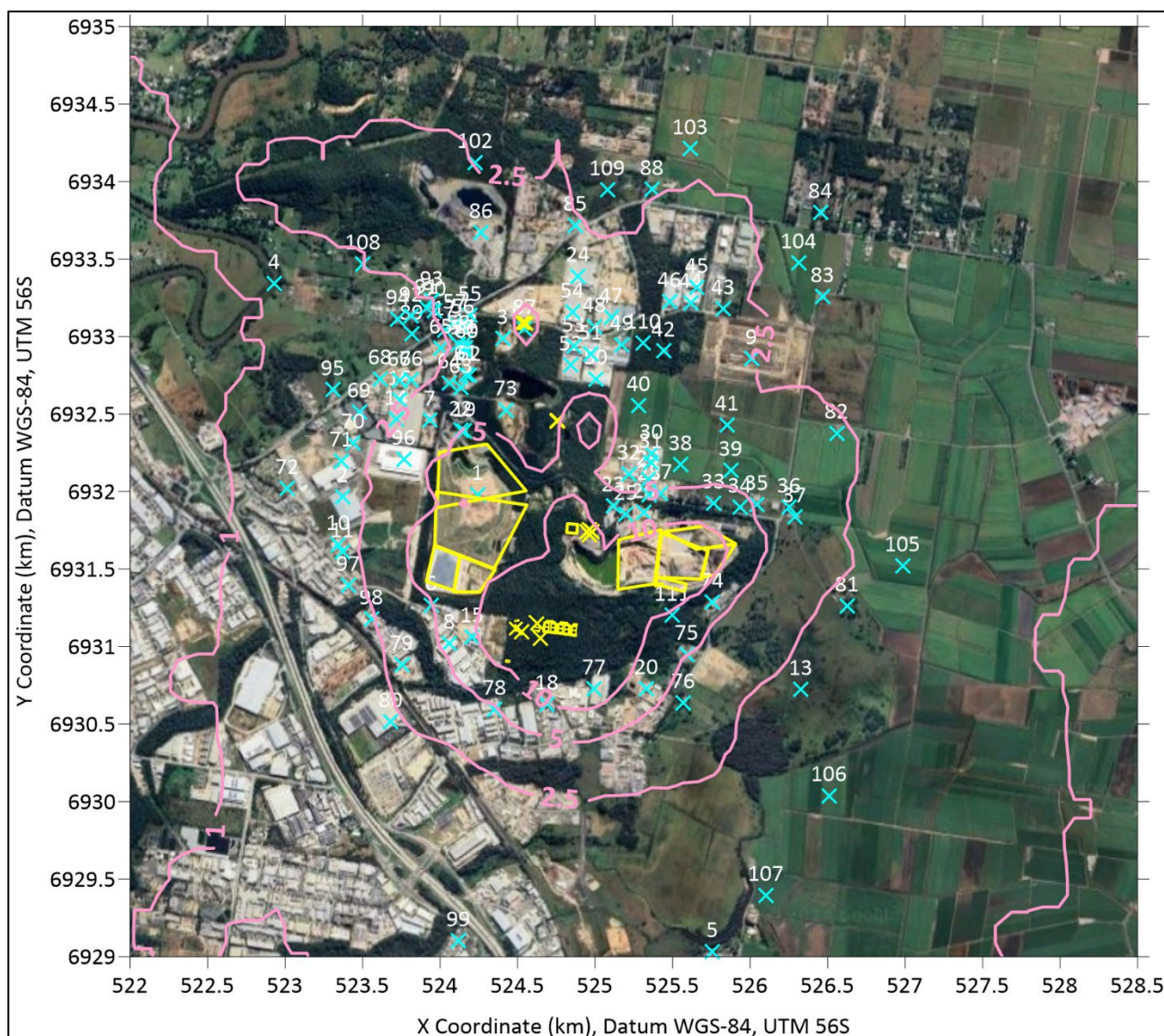


Figure 30 One-hour average 99.5th percentile odour concentration isopleth plot for Scenario 2

Table 49 Odour concentrations at modelled sensitive receptors

Receptor No.	Description	Type of Receptor	Sensitive Receptor (Yes/No)	Scenario 1	Scenario 2
1	Stapylton Landfill Facility	Industrial	No	<u>13.4</u>	<u>14.0</u>
2	Manufacturing or distribution: 205-SP316171	Industrial	No	1.2	1.9
3	Directhit Trenchless	Industrial	No	1.4	3.3
4	Albert River	Ecological	No	0.4	1.1
5	Residential area: Goldmine Rd	Residential	Yes	0.3	1.5
6	Pezzimenti Tunnelbore	Industrial	No	3.0	4.5

Receptor No.	Description	Type of Receptor	Sensitive Receptor (Yes/No)	Scenario 1	Scenario 2
7	JJs Waste and Recycling	Industrial	No	1.9	2.7
8	Pro-Pac Packaging	Industrial	No	1.2	<u>5.6</u>
9	Unknown: excavation	Industrial	No	0.9	2.4
10	Accensi Plant Nutrition Manufacturing	Industrial	No	1.3	2.0
11	Amgrow	Industrial	No	1.3	2.0
12	Eco Centre Storage	Industrial	No	1.4	2.7
13	Sandy Creek	Ecological	No	1.0	2.1
14	Guilders Transport and Logistics	Industrial	No	1.6	2.4
15	ACC Higgins	Industrial	No	1.3	<u>8.7</u>
16	AMFS Australasia	Industrial	No	1.4	2.1
17	Just Cremate Me - Home Mortuary Support Services	Commercial	Yes	1.0	2.3
18	Carroll Engineering Services	Industrial	No	0.8	<u>8.7</u>
19	AWLQ Beenleigh Animal Rehoming Centre	Agricultural / Farmland	No	2.2	3.1
20	Lee's Environmental Waste Management Services	Industrial	No	1.4	<u>6.5</u>
21	Anika Natural Products	Industrial	No	1.5	2.7
22	Stapylton City Pound	Agricultural / Farmland	No	2.3	3.2
23	Boral Concrete	Industrial	No	3.4	<u>5.3</u>
24	Visy Board Stapylton	Industrial	No	0.7	2.6
25	Boral Asphalt	Industrial	No	4.4	<u>6.7</u>
26	BMI Group - Stapylton Resource Recovery	Industrial	No	4.7	<u>7.3</u>
27	ABI Coating Specialists	Industrial	No	3.5	<u>5.4</u>
28	The Car Workshop	Industrial	No	3.2	<u>5.4</u>
29	Westlink Petroleum	Industrial	No	2.5	4.3
30	Penske Australia	Industrial	No	1.8	3.2

Receptor No.	Description	Type of Receptor	Sensitive Receptor (Yes/No)	Scenario 1	Scenario 2
31	Manufacturing/ Industry: Rossmanns Rd 2	Industrial	No	2.0	3.5
32	Manufacturing/ Industry: Rossmanns Rd 1	Industrial	No	2.0	3.7
33	Residence: 197 Rossmanns Road	Residential	Yes	3.7	<u>6.3</u>
34	Residence: 213 Rossmanns Road	Residential	Yes	3.2	<u>5.5</u>
35	Residence: 219 Rossmanns Road	Residential	Yes	2.6	4.6
36	Residence: 370 Burnside Road	Residential	Yes	1.9	3.6
37	A-Plant Plant Hire	Industrial	No	1.8	3.4
38	Agriculture: 222-SP101437	Agricultural / Farmland	No	2.3	3.8
39	Agriculture: 221-SP101437	Agricultural / Farmland	No	2.3	4.3
40	Agriculture: 150-W31134	Agricultural / Farmland	No	1.1	3.1
41	Agriculture: SP327762	Agricultural / Farmland	No	1.4	2.9
42	Residence: 148 Quinns Hill Road	Residential	Yes	0.8	3.2
43	Residence: 181 Quinns Hill Road	Residential	Yes	0.7	2.6
44	Ozroll Industries	Industrial	No	0.6	3.1
45	Centurion Garage Doors	Industrial	No	0.6	3.0
46	Trade Tools Head Office	Industrial	No	0.7	3.3
47	Black Diamond Group	Industrial	No	0.7	3.6
48	Med-X Healthcare Solutions	Industrial	No	0.8	3.4
49	Marland Mushrooms Stapylton	Agricultural / Farmland	No	0.8	3.8
50	Holman Industries	Industrial	No	0.9	3.7
51	All Brands Toys	Industrial	No	0.9	3.7
52	A&L Windows and Doors	Industrial	No	1.0	3.1
53	Nu-Pure Beverages	Industrial	No	0.8	3.0

Receptor No.	Description	Type of Receptor	Sensitive Receptor (Yes/No)	Scenario 1	Scenario 2
54	Visy Board	Industrial	No	0.7	2.9
55	Impact Drill and Blast	Industrial	No	1.0	2.7
56	Welch Property	Industrial	No	1.1	2.6
57	School: Little Scholars School of Early Learning	Educational	Yes	1.0	2.5
58	PowerCap	Industrial	No	1.4	2.6
59	Zero Emissions Developments	Industrial	No	1.5	2.6
60	APB Britco	Industrial	No	1.6	2.7
61	Beenleigh Truck Parts	Industrial	No	2.0	2.8
62	Gold Coast Cyliner Heads	Industrial	No	2.0	2.8
63	Just Jap Truck Spares	Industrial	No	2.2	3.0
64	Eagle Wrecking	Industrial	No	1.9	2.6
65	Industrial: 168 Stapylton - Jacobs Well Road	Industrial	No	1.3	2.3
66	Pro-weld	Industrial	No	1.3	2.0
67	PVC Fencing Warehouse	Industrial	No	1.2	1.9
68	SEQ Landscape Supplies	Industrial	No	1.0	1.6
69	Recreation: Beenleigh Drive-in	Residential	Yes	1.0	1.7
70	Red Horse Transport	Industrial	No	1.3	2.0
71	National Tiles	Industrial	No	1.1	1.8
72	Residences: The Lodge Beenleigh 7 Poplar Crescent	Residential	Yes	0.7	1.3
73	Boral Quarries	Industrial	No	2.8	3.6
74	Civilmart	Industrial	No	3.9	<u>5.9</u>
75	Industry: 243 Burnside Road	Industrial	No	2.6	4.9
76	Residence: 222 Burnside Road	Residential	Yes	1.3	3.8
77	Multinail Australia	Industrial	No	1.0	<u>12.6</u>

Receptor No.	Description	Type of Receptor	Sensitive Receptor (Yes/No)	Scenario 1	Scenario 2
78	Austspray Environmental Weed Control	Industrial	No	0.7	4.9
79	Australian Tyre Processors	Industrial	No	0.8	2.8
80	Aldi Distribution Warehouse	Industrial	No	0.5	2.2
81	Residence: 360 Burnside Road	Residential	Yes	1.1	2.2
82	Residence: 26 Jacosa Road	Residential	Yes	1.3	2.6
83	Residence: 512 Burnside Road	Residential	Yes	0.6	2.1
84	Residential area: Alberton	Residential	Yes	0.4	2.0
85	Hotel: The Gem Hotel	Commercial	Yes	0.6	2.6
86	Yellowwood Quarry	Industrial	No	0.7	3.1
87	Residence: 42 Quinns Hill Road	Residential	Yes	1.1	4.7
88	Residence: 10 Alberton Road	Residential	Yes	0.5	2.1
89	Residence: 163 Stapylton - Jacobs Well Road	Residential	Yes	0.8	1.8
90	Residence: 29 Quinns HillW Road Stapylton	Residential	Yes	0.8	2.4
91	A Direct Cremation Brisbane	Commercial	Yes	0.8	2.3
92	NewHaven Funerals and Crematorium	Commercial	Yes	0.8	1.9
93	Residence: 22 Quinns HillW Road	Residential	Yes	0.8	2.5
94	Residence: 10 Ironbark Ct	Residential	Yes	0.7	1.8
95	Residence: 10 Yellowwood Road	Residential	Yes	0.7	1.3
96	Manufacturing or distribution: 201-SP316171	Industrial	No	1.5	2.4
97	Elite Diesel Performance	Industrial	No	1.2	2.1
98	Abdri Masonry	Industrial	No	1.1	2.4
99	Residential area: Norfolk	Residential	Yes	0.2	1.3
100	Residential area: Yatala	Residential	Yes	0.2	0.5

Receptor No.	Description	Type of Receptor	Sensitive Receptor (Yes/No)	Scenario 1	Scenario 2
101	Recreation: Mount Warren Park	Recreational / Park	Yes	0.2	0.6
102	Yellowwood Reserve	Ecological	No	0.5	2.4
103	Agriculture: 14 Alberton Road Alberton	Agricultural / Farmland	No	0.4	2.2
104	Agriculture: 442 Stapylton - Jacobs Well Road	Agricultural / Farmland	No	0.5	2.1
105	Agriculture: 364 Burnside Road Gilberton	Agricultural / Farmland	No	1.0	1.8
106	Agriculture: 292 Goldmine Road Gilberton	Agricultural / Farmland	No	0.6	1.5
107	Agriculture: 276 Goldmine Road Norwell	Agricultural / Farmland	No	0.4	1.6
108	Yellowwood Residential area	Residential	Yes	0.5	1.7
109	Woolshed Parkland	Ecological	No	0.5	1.9
110	Quinns Hill reserve	Ecological	No	0.8	3.7
111	Bandicoot Environmental Reserve	Ecological	No	<u>5.9</u>	<u>8.3</u>

Notes: 1. Values highlighted bold and underlined indicate odour concentration at or exceeding the assessment criterion of 5.0 ou.

Summary and Conclusions

An odour impact assessment was conducted for the ARRC to investigate the potential odour impact of the current and future site operations on the surrounding communities. Dispersion modelling has been conducted for both current and future activities using odour emission rates from the historical site-specific odour emission data from the Stapylton landfill odour sampling (conducted by TOU Pty Ltd) in July 2023. Where there have been process units that were not sampled (i.e. existing landfill green waste pad and proposed ARRC precincts), odour emission data has been obtained from ARRC precincts' design reports, sample results from other local sites and Stantec's global emission and contaminant load database with the most representative data adopted. For BMI Group's SRRF which has been included as a background odour source in this assessment, odour emission data for the Stage 3 works (being the higher odour impact works) in the previous SRRF air quality impact assessment undertaken by Katestone environmental Pty Ltd in February 2017 have been considered.

The model results show that:

1. In Scenario 1 (existing Stapylton landfill and BMI Group SRRF), the assessment criterion of 5.0 ou is exceeded at two modelled discrete receptors. These receptors include the landfill itself and the Bandicoot environmental reserve which are not considered sensitive receptors.
2. In Scenario 2 (proposed ARRC precincts, covered areas of the existing Stapylton landfill and the BMI Group SRRF), the assessment criterion of 5.0 ou is exceeded at fifteen modelled discrete receptors, of

which two are considered sensitive. These are all already located adjacent to the BMI landfill and whilst they are considered sensitive receptors due to them being residential dwellings, the residents are unlikely to be highly sensitive given their current location and being within an industrial amenity area.

The proposed works, as modelled, include the following odour mitigation measures:

- Providing cover over the disused landfill cells
- Ventilation of the MRF building
- Extraction and treatment of foul air from the receiving and processing hall of the residual WtE plant through the boilers, and discharge of treated air in the flues

Apart from the two residences (receptors #33 and 34) on Rossmans Rd, the proposed ARRC Precincts works, including the above odour mitigation measures, will increase odours at most receptors, yet the increase is unlikely to cause odour nuisance at any of the sensitive receptors modelled.

4.7.3 Air Quality

Legislative Context

The National Environment Protection Council (NEPC) was established under the *National Environment Protection Council Act 1994* (NEPC Act). The primary functions of the NEPC are to:

- prepare National Environment Protection Measures (NEPMs)
- assess and report on the implementation and effectiveness of the NEPMs in each state and territory.

NEPMs are a special set of national objectives designed to assist in protecting or managing aspects of the environment, e.g., air quality. The NEPM relevant to air quality for the project are:

- **National Environmental Protection (Ambient Air Quality) Measure 2021 (Air NEPM):** the Air NEPM outlines standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure.
- **National Environmental Protection (Air Toxics) Measure 2011 (Air Toxics NEPM):** the objective of the Air Toxics NEPM is to improve knowledge regarding ambient air toxic pollutants within areas containing sensitive receptors that are likely to be impacted by elevated concentrations to facilitate development of standards that will allow for the protection of human health and well-being.

Queensland Environmental Protection (Air) Policy

In Queensland, the regulation of environmental impacts from air emissions associated with ERAs is governed by the EP Act and its subordinate legislation, including the *Environmental Protection Regulation 2019* (EP Reg) and the Environmental Protection (Air) Policy (EPP Air). The EP Act establishes a framework for regulating ERAs, requiring an environmental authority to conduct such activities. This authority may impose conditions to safeguard the environmental values of air from harm, defined as any adverse or potentially adverse effect on these values.

The EP Regulation and EPP Air provide detailed guidance on the assessment and decision-making process for applications. The EPP Air outlines the environmental values to be protected or enhanced and sets air quality objectives for specific contaminants to protect these values. These objectives are based on national and

international standards, including the National Environment Protection (Ambient Air Quality) Measure, the National Environment Protection (Air Toxics) Measure, the World Health Organization (WHO) Guidelines for Europe (2000), and the United States Environmental Protection Agency (USEPA) standards.

The term “environmental value” encompasses the physical, aesthetic, social, and cultural attributes of a location or proposed site. Specific environmental values pertinent to air quality are defined in the EPP Air.

According to the EPP Air, the following environmental values are to be enhanced or protected:

- The qualities of the air environment that support the **health and biodiversity of ecosystems**.
- The qualities of the air environment that promote **human health and wellbeing**.
- The qualities of the air environment that preserve the **aesthetics of the environment**, including the appearance of buildings, structures, and other properties.

The qualities of the air environment that support **agricultural use** of the environment.

Queensland Energy-from-Waste Policy

This non-statutory policy, operating in conjunction with other key strategic documents under the waste strategy, has been formulated to facilitate the implementation of Queensland’s Waste Management and Resource Recovery Strategy (the waste strategy). It provides a comprehensive overview of the following aspects related to energy-from-waste (EfW) activities in Queensland including:

- Stakeholder Engagement: Outlines the expectations for proponents to engage appropriately with stakeholders in the EfW sector.
- EA Application: Details the information required to support an EA application for an EfW facility.
- Environmental Regulation: Describes the environmental regulation of EfW facilities.

This policy establishes a framework designed to provide clarity to EfW proponents regarding the requirements. This clarity helps ensure that any EfW facilities developed in Queensland meet technical, environmental, regulatory, and community expectations, aligning with the best interests of Queenslanders.

The EfW Policy specifically references the Best Available Techniques Reference Documents (BREFs) for Waste Incineration (WI) ¹ and the BREF for Waste Treatment (WT), noting Proponents are expected to demonstrate the use of best practices as outlined in said BREFs.

According to the Policy, *“To ensure continued protection of Queensland’s environment and consistent regulation across Queensland, relevant EfW facilities that are lawfully operating when this policy commences will be expected to demonstrate, within 5 years, that their facilities are operating within the limits and best practices stipulated in the applicable BREF”.*

¹ Regulated by the Industrial Emissions Directive 2010/75/EU, The WI BREF is a European Union document that outlines the best available techniques (BAT) for waste incineration. It provides detailed technical guidelines and standards to ensure high levels of environmental protection and operational efficiency in waste incineration processes. The document covers various aspects, including emission limits, monitoring requirements, and operational practices.

Assessment Criteria

Assessment criteria, as listed in the EPP Air, are presented in Table 50. These include the revised criteria listed in the Environmental Protection (Air) Amendment Policy 2024. This assessment adopts the PM_{2.5} and SO₂ criteria commencing on 1 January 2025 as the project development approval applications and subsequent commissioning will occur post January 2025.

There are no national air quality guideline values for nuisance dust effects in Australia. According to the EP Act Guideline for Activities with Impacts to Air, a dust deposition limit of 120 mg/m²/day, averaged over one month, is frequently used in Queensland.

The assessment criterion for benzene was selected to benchmark predicted VOC concentrations. This is considered a highly conservative approach as the total volatile compounds will not be 100% benzene and will likely comprise of a multitude of compounds (such as ethylbenzene, xylene, toluene etc), the assessment criteria for which are significantly higher than that of benzene.

Table 50 EPP Air assessment criteria

Indicator	Environmental Value	Mg/m ³ (except where noted)	ppm (volume/volume)	Period
Arsenic and compounds*	Health and wellbeing	6 ng/m ³	-	1 year
Benzene	Health and wellbeing	5.4	0.002	1 year
Cadmium and compounds*	Health and wellbeing	5 ng/m ³	-	1 year
Carbon monoxide	Health and wellbeing	11 mg/m ³	9	8 hours
Formaldehyde	Health and wellbeing	-	0.040	24 hours
Inorganic mercury vapour	Health and wellbeing	1.1	-	1 year
Lead and compounds *	Health and wellbeing	0.5	-	1 year
Manganese and compounds *	Health and wellbeing	0.16	-	1 year
Nickel and compounds *	Health and wellbeing	22 ng/m ³	-	1 year
Nitrogen dioxide	Health and wellbeing	164	0.08	1 hr
		31	0.015	1 year
	Health and biodiversity of ecosystems	33	0.016	1 year
Pm _{2.5}	Health and wellbeing	25	-	24 hours
		8	-	1 year
Pm _{2.5} (after 1 January 2025)	Health and wellbeing	20	-	24 hours
		7	-	1 year
Pm ₁₀	Health and wellbeing	50	-	24 hours

Indicator	Environmental Value	Mg/m ³ (except where noted)	ppm (volume/volume)	Period
	Health and wellbeing	25	-	1 year
Sulphur dioxide	Health and wellbeing	286	0.1	1 hr
		57	0.02	24 hours
	Protecting agriculture	31	0.011	1 year
	Health and biodiversity of ecosystems (for forests and natural vegetation)	21	0.0075	1 year
Sulphur dioxide (after 1 January 2025)	Health and wellbeing	214	0.075	1 hr
Toluene	Health and wellbeing	-	1.0	24 hours
	Health and wellbeing	-	0.1	1 year
Total suspended particles	Health and wellbeing	90	-	1 year
Vanadium and compounds*	Health and wellbeing	1.1	-	24 hours
Xylenes	Health and wellbeing	-	0.25	24 hours
	Health and wellbeing	-	0.20	1 year

*measured as the total metal content in PM₁₀

Additional sources for assessment criteria

Assessment criteria for pollutants and/or averaging periods not included in the *EPP Air* were sourced from the Victorian EPA Publication 1961 (Table 51) and Texas Commission on Environmental Quality Effects Screening Levels (TCEQ, 2016) (TCEQ-ESLs – Table 52).

The Victorian EPA Publication 1961 is a technical guide for air pollution practitioners that presents air pollutant assessment criteria (APACs) for the assessment and management of air emissions. These APACs are not intended to be concentration limits, below which no action is required. Rather, the APACs provide concentration benchmarks against which potential risks to human health and the environment may be understood. In the modelling context, exceedance of one or more of the APACs indicates that an activity has the potential to pose an unacceptable risk to human health or the environment.

Table 51 Victorian EPA Publication 1961 APACs

CAS Number	Substance	Class	Cumulative/ Incremental	Averaging Period	ppm	µg/M3	Basis
7664-41-7	Ammonia	2	Cumulative	1 hour	4.6	3,200	OEHHA
				24 hours	1.7	1,184	ATSDR
				1 year	0.1	70	ATSDR

CAS Number	Substance	Class	Cumulative/ Incremental	Averaging Period	ppm	µg/M3	Basis
7440-36-0	Antimony and antimony compounds	2	Cumulative	24 hours	NA	1	ATSDR
			Cumulative	1 year	NA	0.3	ATSDR
7440-41-7	Beryllium and beryllium compounds	3	Cumulative	1 year	NA	0.02	US EPA
7440-43-9	Cadmium and cadmium compounds	3	Cumulative	1 hour	NA	18	TCEQ
			Cumulative	24 hours	NA	0.03	ATSDR
			Cumulative	1 year	NA	0.005	WHO
18540-29-9	Chromium (hexavalent)	3	Cumulative	1 hour	NA	1.3	TCEQ
			Cumulative	1 year	2.3x10 ⁻⁶	0.005	ATSDR
7440-50-8	Copper and copper compounds	-	Cumulative	1 hour	NA	100	OEHHA
1746-01-6	Dioxins and furans (as TCDD equivalents)	3	Cumulative	1 year	3x10 ⁻⁹	0.00004	OEHHA
7647-01-0	Hydrogen chloride	2	Cumulative	1 hour	1.4	2,100	OEHHA
7647-01-0	Hydrogen chloride	-	Cumulative	1 year	0.01	20	US EPA
7439-97-6	Mercury and mercury compounds	2	Cumulative	1 year	NA	1	WHO

Class 1: Represents the highest level of concern, involving pollutants that have significant health impacts even at low concentrations.

Class 2: Indicates pollutants that are of moderate concern, requiring careful management to prevent adverse effects.

Class 3: Pollutants that are of lower concern but still need to be controlled to avoid cumulative impacts.

Table 52 TCEQ-ESLs

Substance	Averaging Period	µg/M3
Selenium (Se)	1 hour	2
Tin (Sn)	1 hour	20

Existing Environment and Ambient Air Quality

Climatic Conditions

Meteorological conditions are important for determining the direction and rate at which emissions from a source disperses. The key meteorological parameters for air dispersion are wind speed, wind direction, temperature, rainfall, and relative humidity. Historical meteorological data in the vicinity of the study area was reviewed in this section to demonstrate the existing local meteorological conditions.

BoM stations near ARRC that were used to assess the existing climatic environment were Archerfield Airport (BoM station ID: 040211), Greenbank (BoM station ID: 140009) and Gold Coast Seaway (BoM station ID: 040764). Archerfield airport is located at 27.57 S and 153.01 E with an elevation of 12.5 m and is approximately 27 km from ARRC.

Sensitive Receptors

According to the ESR/2015/1840 (Queensland Government, 2024), a sensitive place could include but is not limited to:

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises
- a motel, hotel or hostel
- a kindergarten, school, university or other educational institution
- a medical centre or hospital
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 2004* or a World Heritage Area
- a public park or garden
- a place used as a workplace including an office for business or commercial purposes.

The sensitive receptors identified for this AQIA have been identified and are represented in Figure 31. The receptors were categorised according to their environmental value, i.e.:

- Health and wellbeing:
 - Schools
 - Residences and hotels
 - Recreational areas
- Workplaces, including animal shelters, crematoria, industrial, commercial and manufacturing receptors.
- Health and biodiversity of ecosystems for forests and natural vegetation:
 - Reserves, creeks and rivers
- Agricultural areas

The ARRC Precinct is primarily surrounded by industrial, commercial and manufacturing receptors. Nearby sensitive receptors include:

- The “Little Scholars School of Early Learning” (#109) located 125 m west of the ARRC Precinct (Circular Economy Hub) and 910 m northwest of the residual WtE facility.
- Nearby residential receptors including:
 - A single residence at 148 Quinns Hill E Road (#89) is 450 m northeast of the ARRC Precinct and 850 m northeast of the residual WtE facility.
 - Residences along Rossmanns Road (#85 - #87) are located along the northern boundary of the ARRC Precinct transport route, 1 km – 1.5 km southeast of the residual WtE facility.
 - Residences at 163 Stapylton - Jacobs Well Road (#97) and 29 Quinns Hill W Road (#98) are approximately 400 m west of the ARRC Precinct (Circular Economy Hub) and 1 km northwest of the residual WtE facility.

-
- The Norfolk low density residential area (#106) is located approximately 500 m northwest of the ARRC Precinct and 1.2 km northwest of the residual WtE facility.
 - “The Lodge Beenleigh” residential area (#104) is approximately 1.2 km southwest of the ARRC Precinct and 1.8 km southwest of the residual WtE facility.
 - The AWLQ Beenleigh Animal Rehoming Centre (#11) and The City Stapylton City Pound (#12), located approximately 50 m west of the ARRC Northern Precinct and 620 m west of the residual WtE facility.
 - The agricultural cropland within 1 km east of the ARRC Northern Precinct, represented by receptors #1 - #4.

Existing Ambient Air Quality

ARRC is located in within the urban area of Stapylton but is surrounded by residential, farmland and industrial areas. The main existing emissions are likely natural sources such as sea spray and wind-blown dust, traffic using major road networks, emissions from burning (cane fields and the crematorium), and waste disposal and energy generation activities. While the Stapylton area is the focus of existing sources there are likely to be other air emission sources outside this.

A NPI database review was conducted to identify existing emission sources in the vicinity of the study area. The closest facilities that reported emissions to the NPI for 2022/2023 reporting period were a waste treatment plant (Stapylton Resource Recovery), a landfill with energy generation (City of Gold Coast Stapylton landfill and LMS Energy). These facilities reported multiple emissions which have been summarised in Table 53.

The facilities are all within one kilometre of the project area to the south and south-west. The project area has potential to be impacted by emissions from the operations of these facilities, but the extent is difficult to determine without local monitoring.

Table 53 Emissions of City of Gold Coast, LMS Energy and Stapylton Resource Recovery for 2022/2023

Substance total (kg/year)	City of Gold Coast Stapylton Landfill	LMS Energy	Stapylton Resource Recovery
Ammonia	500	-	-
Antimony & compounds	0.16	-	3.4
Arsenic & compounds	0.033	0.58	1.3
Benzene	51	-	-
Beryllium & compounds	0.011	-	-
Cadmium & compounds	0.033	0.82	3.9
Carbon Monoxide	16,000	97,000	16,000
Chromium (VI)	0.043	-	-
Copper & compounds	0.13	1.1	0.0049
Ethylbenzene	30	-	-
Fluoride compounds	-	-	0.035
Lead & compounds	0.15	0.89	40
Manganese & compounds	-	-	0.0046
Mercury & compounds	0.0049	0.011	-

Substance total (kg/year)	City of Gold Coast Stapylton Landfill	LMS Energy	Stapylton Resource Recovery
Nickel & compounds	0.40	11	-
NOx	22,000	62,000	40,000
PM _{2.5}	410	340	3,100
PM ₁₀	430	340	16,000
Polychlorinated dioxins and furans (TEQ)	0.00000076	-	-
SO ₂	250	5,900	42
Toluene	890	-	-
Total VOCs	2,600	3,100	3,700
Xylenes	57	-	-

The closest DETSI air quality monitoring station (AQMS) is Coomera, located approximately 16km southeast of the ARRC where PM_{2.5}, PM₁₀, nitrogen dioxide (NO₂) and CO are measured. Monitoring at Coomera only commence in 2023, therefore data from other nearby DESI AQMS were also obtained to better understand the historical trends. Springwood AQMS, is located approximately 18km northwest of the ARRC. At Springwood the following parameters are measured PM_{2.5}, PM₁₀, NO₂, sulphur dioxide (SO₂) for 2021-2023, while and some VOCs (Benzene, Toluene, Ethyl-benzene and Xylene) were measured from 2018-2020 (Table 54). Carbon monoxide (CO) and TSS data between 2021 and 2023 was therefore obtained from other DETSI AQMS. Overall, all AQMS used to assess the background air quality at the Project area are listed in Table 54. It should be noted that Cannon Hill AQMS is located next to a transport rail line for coal, and therefore the TSS measurements are likely impacted by this source but was conservatively included.

Table 54 Summary of DETSI AQMS used in the assessment

Station name	Operator	Coordinates	Location relative to the project	Pollutants monitored	Years of data available
Cannon Hill	DESI	27°27'55.40"S, 153° 5'12.96"E	34km NNW	TSS	2021 to 2023
Coomera	DESI	27°51'48.28"S, 153°19'32.67"E	16km SE	PM _{2.5} , PM ₁₀ , NOx, CO	2023
Parkwood	DESI	27°57'10.43"S, 153°20'45.66"E	26km SSE	CO	2023
South Brisbane	DESI	27°29'5.32"S, 153° 1'55.31"E	35km NW	CO	2021 to 2023

Station name	Operator	Coordinates	Location relative to the project	Pollutants monitored	Years of data available
Southport	DESI	27°57'42.42"S, 153°24'8.22"E	30km SE	PM _{2.5} , PM ₁₀ , NO _x ,	2021 to 2023
Springwood	DESI	27°36'45.18"S, 153° 8'8.57"E	18km NW	PM _{2.5} , PM ₁₀ , NO _x , SO ₂	2021 to 2023
				VOCs (Benzene, formaldehyde, toluene, xylenes)	2018 to 2020

PM₁₀ and PM_{2.5} monitoring between 2021 and 2023 at the Coomera, Southport and Springwood AQMS showed concentrations consistently below the adopted air quality criteria for the project. A summary of the monitoring data is provided in Table 55. Between 2021 and 2023, there was one exceedance day for PM₁₀. The PM₁₀ exceedance in late 2023 was due to a bush fire event.

TSS monitoring at Cannon Hill AQMS, as summarised in Table 56, shows a similar consistency of measurement data below the adopted air quality criteria for the project.

Table 55 Summary statistics of PM_{2.5} and PM₁₀ observations at Coomera, Southport and Springwood stations 2021-2023

Averaging Period	Statistic	PM _{2.5}			PM ₁₀		
		Coomera	Southport	Springwood	Coomera	Southport	Springwood
24-hr	Data coverage (per cent)	57	98	97	57	98	97
	Maximum concentration (µg/m ³)	24	23	24	54	46	48
	90th percentile (µg/m ³)	9.7	7.6	8.6	25	18	18
	Criteria (µg/m ³)	25	25	25	50	50	50
	Exceedances (days)	0	0	0	1	0	0
Annual	Average concentration (µg/m ³)	6.6	4.7	5.5	16	11	11
	Criteria (µg/m ³)	8.0	8.0	8.0	25	25	25

Table 56 Summary of annual average TSS observations at Cannon Hill station 2021-2023

Statistic		TSS
Annual	Average concentration (ppm)	21
	Criteria (ppm)	90

Gaseous monitoring data between 2021 and 2023 at the DETSI AQMS is summarised in the Table 57 for NO₂, Table 58 for CO, and Table 59 for SO₂. The monitoring data indicated concentrations consistently below the adopted air quality criteria for the project with no exceedances measured.

Table 57 Summary of 1-hr average NO₂ observations at Coomera, Southport and Springwood stations 2021-2023

	Statistic	NO ₂		
		Coomera	Southport	Springwood
1-hr	Data Coverage (%)	58	97	95
	Max. Conc. (ppm)	0.034	0.038	0.033
	Criteria (ppm)	0.080	0.080	0.080
	No. exceedance days	0	0	0
Annual	Average concentration (ppm)	0.0060	0.0043	0.0050
	Criteria (ppm)	0.015	0.015	0.015

Table 58 Summary of 8-hr average CO observations at Coomera, Parkwood and South Brisbane stations 2021-2023

	Statistic	CO		
		Coomera	Parkwood	South Brisbane
8-hr	Data Coverage (per cent)	58	100	95
	Max. Conc. (ppm)	0.54	0.97	1.1
	Criteria (ppm)	9.0	9.0	9.0
	No. exceedance days	0	0	0

Table 59 Summary of 1-hr average SO₂ observations at Springwood station 2021-2023

	Statistic	SO ₂
1hr	Data Coverage (%)	93
	Max. Conc. (ppm)	0.011
	Criteria (ppm)	0.10
	No. exceedance days	0

The most recent ambient VOC monitoring at DETSI south east Queensland AQMS was at the Springwood station between 2018 and 2020. A summary of the monitoring is provided in Table 60.

Table 60 Summary of VOCs (benzene, toluene, xylenes, and formaldehyde) 24hr and annual data at Springwood station 2018-2020.

	Statistic	VOC			
		Benzene	Toluene	Xylenes	Formaldehyde
24-hr	Data Coverage (%)	39	39	39	35
	Max. Conc. (ppm)	-	0.0077	0.021	0.026
	Criteria (ppm)	-	1.0	0.25	0.040
	No. exceedance days	-	0	0	0
Annual	Average concentration (ppm)	0.00096	0.0019	0.0082	-
	Criteria (ppm)	0.0020	0.10	0.20	-

In May 2013 the Queensland Government Department of Science, Information Technology, Innovation and the Arts (DSITIA) conducted ambient air quality for heavy metals near a foundry operating in Currumbin approximately 50km South of the ARRC Precinct (DSITIA, 2013). Heavy metals monitoring is not common in South East Queensland however monitoring in close proximity to an operating foundry is considered a very conservative upper bounds of what ambient heavy metals may be present in the ARRC precinct airshed. A summary of the measured heavy metals concentrations is provided in Table 61.

Table 61 Summary of Queensland Government 2013 Heavy Metals Monitoring near Currumbin Foundry

Heavy Metal	Averaging Period	Criteria (µg/M³)	Measured Concentration (µg/M³)
Arsenic (As)	Annual	0.006	0.0003
Cadmium (Cd)	24-hr	0.03	0.0004
	Annual	0.005	0.0001
Mercury (Hg)	Annual	1	0.0001
Manganese (Mn)	Annual	0.16	0.0027
Nickel (Ni)	Annual	0.022	0.0016
Lead (Pb)	Annual	0.5	0.0033
Vanadium (V)	24HR	1.1	0.0002

Adopted background concentrations

The air quality monitoring reports and datasets considered indicate that air quality in the study area was typically rated as a good air environment. Table 62 summarises the background concentrations used in the assessment of the ARRC's cumulative impact.

Table 62 Background concentration used in the cumulative impact assessment

Substance	Period	Criteria (µg/M3)	Background Concentration (Ug/M3)	Percentage Of Criteria	Source
As	Annual	0.006	0.0003	5%	Currumbin foundry report
Cd	1-hr	18	-	0%	Not available, assumed negligible
Cd	24-hr	0.03	0.0004	1%	Currumbin foundry report
Cd	Annual	0.005	0.0001	2%	Currumbin foundry report
CO	8-hr	11000	1293.6	12%	Maximum concentrations at Parkwood and South Brisbane
Co	Annual	0.1	-	0%	Not available, assumed negligible
Cr	1-hr	1.3	-	0%	Not available, assumed negligible
Cr	Annual	0.005	-	0%	Not available, assumed negligible
Cu	1-hr	100	-	0%	Not available, assumed negligible
HCL	1-hr	2100	-	0%	Not available, assumed negligible
HCL	Annual	20	-	0%	Not available, assumed negligible
HF	90 days	0.25	-	0%	Not available, assumed negligible
HF	24-hr	0.8	-	0%	Not available, assumed negligible
HF	30 day	0.4	0.11	28%	Runcorn foundry report
HG	Annual	1	0.0001	0%	Currumbin foundry report
Mn	Annual	0.16	0.0027	2%	Currumbin foundry report
NH ₃	1-hr	3200	-	0%	Not available, assumed negligible
NH ₃	24-hr	1184	-	0%	Not available, assumed negligible
NH ₃	Annual	70	-	0%	Not available, assumed negligible
Ni	Annual	0.022	0.0016	0%	Currumbin foundry report
NO ₂	1-hr	164	72.9	44%	Maximum concentrations at Springwood and Southport
NO ₂	Annual	31	9.5	31%	Annual average from Springwood and Southport

Substance	Period	Criteria (µg/M3)	Background Concentration (Ug/M3)	Percentage Of Criteria	Source
Pb	Annual	0.5	0.0033	1%	Currumbin foundry report
PCDD	1-hr	0.000002	-	0%	Not available, assumed negligible
PCDD	Annual	0.00004	-	0%	Not available, assumed negligible
PM (TSP)	Annual	90	23	26%	Annual average from cannon hill
PM ₁₀	24-hr	50	18	36%	90th percentile from Springwood and Southport
PM ₁₀	Annual	25	11	44%	Annual average from Springwood and Southport
PM _{2.5}	24-hr	20	8.1	41%	90 th percentile from Springwood and Southport
PM _{2.5}	Annual	7	5.1	73%	Annual average from Springwood and Southport
Sb	24-hr	1	-	0%	Not available, assumed negligible
Sb	Annual	0.3	-	0%	Not available, assumed negligible
SO ₂	1-hr	214	31.4	15%	Maximum readings at springwood
SO ₂	24-hr	57	5.7	10%	Maximum readings at springwood
SO ₂	Annual	21	0.9	4%	Springwood annual average
Tl	1-hr	1	-	0%	Not available, assumed negligible
Tl	Annual	0.1	-	0%	Not available, assumed negligible
V	24-hr	1.1	0.0002	0%	Currumbin foundry report
VOCs	Annual	5.4	3.48	64%	Benzene from springwood 2018-2020

Emissions Inventory

Waste to Energy facility

The ARRC Residual WtE facility is being designed in accordance with the principles described in the Best Available Techniques (BAT) Reference Document for Waste Incineration (commonly known as the WI BREF – European Commission 2019). The WI BREF provides upper limits for emissions and detailed information on emissions control technologies that may be adopted to achieve said emissions limits.

Emissions control technology

The concentrations of some pollutants in the flue gas leaving the combustion system, such as nitrogen oxide and nitrogen dioxide (together referred to as NO_x), CO, VOCs, and dioxins and furans (PCDD/F TEQ), are directly linked to the performance of the combustion system as well as the composition of the waste fuel.

Both primary and secondary emission control measures will be in place to meet the regulatory requirement for the flue gas before leaving the stack.

Appropriate airflow through the primary and secondary treatment systems will be maintained as dictated by the automatic combustion control system to sustain the quantity and quality of the thermal heat input to the boiler units and control the formation of NO_x and CO. In addition, the temperature of the furnace will be adequately maintained well above 850°C for at least 2 seconds residence time to ensure the destruction of VOCs, dioxins and furans and other organic compounds commonly found in the residual waste combustion systems.

A secondary NO_x abatement system within the boiler known as Selective Non-Catalytic Reduction (SNCR) is envisaged. SNCR involves injecting ammonia or urea solution into the combustion chamber within a temperature range of ~900 – 1050 °C. Within this temperature range, the ammonia or urea will reduce a significant portion of the NO_x that may be present in the flue gas to nitrogen and water. The performance and suitability of a SNCR system will be determined by the OEM to meet environmental regulatory requirements.

A portion of the ash generated by the combustion of waste fuels will enter the exhaust flue gas. This ash stream is referred to as fly ash. Most of this ash will be extracted from the flue gas within the boiler heat recovery passes and fed via extraction conveyors to the main fly ash hoppers. The residual fly ash will be removed via high efficiency flue gas cleaning filters, typically of the fabric filter type. These filters have a typical removal efficiency of 99.9%.

An activated carbon injection system will likely be required to control mercury, dioxins and furans in the flue gas. This system injects a plume of activated carbon particles into the exhaust gas, which reacts with and binds these species into a particulate that can be extracted by the dust collection filter (fabric filter). A dry or semi-dry scrubber technology is typically applied for SO_x removal, acid gas treatment and additional control of dioxins and furans in the flue gas.

Depending on the operating regime of the waste incinerator, heat collection and flue gas treatment systems, a flue gas reheating system may be required before the gases are extracted from the process and expelled to atmosphere. This system is primarily aimed at preventing plume visibility within the exhaust system. The need for such a system needs to be evaluated for all unit operating conditions and ambient temperature operating cases.

Stack Parameters

At concept level, indicative stack parameters for the Residual WtE stack under various load scenarios were provided by the Residual WtE design engineers for use in the dispersion simulations (Table 63). These load scenarios are described as:

- **Minimum mechanical load:** 70% of the throughput and corresponding 70% thermal input to the boiler. However, the lowest possible operating point has been defined at 60% of the plant's designed capacity, under this scenario, auxiliary fuel may need to assist while sustaining the combustion.

- **Design case:** The plant is designated to operate at the 100% of the designed capacity which represents a design waste throughput of 41.7 ton per hour per line under 100% mechanical load and corresponding 100% thermal input of 121.5 MWth (LHV) per line.
- **Peak output:** At the higher output side, the plant will ideally be designed to operate up to 105% of the designed capacity for a shorter duration (i.e. not more than 2 hours per day basis). This allows for fluctuations in fuel handling system input and variations in the calorific value of the fuel. It is not intended that the plant be run in this condition continuously. Similarly, the plant possibly could withstand operation mode under an abnormal Load case at 110% of the designed capacity, but this is very rare and should not be more than a few minutes in duration on a single unit at a time only.

It is anticipated that two boiler flues (measuring approximately 2.6 m across) will be contained within a single stack shell (measuring approximately 6 m across). The flue stacks will extend 3 – 4 m above the stack shell to a height of 80 – 100 m.

Table 63 Concept level stack parameters for the Residual WtE boiler stack*

Plant Data	Units	Maximum Load	Normal Load	Low Load	Minimum Load
Boilers Running	-	2	2	2	1
Thermal Load on each boiler	%	110	100	60	60
Data On Each Boiler as below (at nominated Load Case)					
Exhaust Gas Temperature Range Expected	°C	125-150			
Stack Exhaust Pressure	BarA	1.001			
Stack Height	m	80 -100 m			
Stack Liner Diameter (Single Boiler)	m	2.579	2.579	2.579	2.579
Stack Mass Flow (Each Boiler)	tph	339.1	307.5	208.5	209.1
Stack Exhaust Velocity	m/s	20.3	18.3	12.1	12.2
Stack Volume Flow (Each Boiler)	m ³ /s	106.03	95.51	63.34	63.67
Mole % H ₂ O	%	22.11	21.79	19.34	19.67
Mole % CO ₂	%	8.78	8.82	7.85	7.82
Mole % O ₂	%	6.24	6.27	7.9	7.86
Mole % N ₂	%	62.12	62.37	64.14	63.88
Mole % Ar	%	0.75	0.75	0.77	0.77

*values are provided on a per boiler flue basis.

Emissions Estimation

Upper limits from the WI BREF (Table 64) were used to define the upper bounds of the anticipated emissions from the Residual WtE facility. Where cumulative limits for heavy metals were specified, the European Union (2010) Directive 2010/75/EU limits were used to speciate the substances based on their relative composition as a percentage of the total (Table 65).

Assuming these upper limits would be reached under “maximum load” conditions (i.e. 110%); the normal load (100%), low and minimum load (60%) emissions were calculated assuming a linear relationship between load and emissions. Higher exit temperatures result in higher buoyancy and therefore (typically) better dispersion. Emissions were therefor conservatively calculated assuming a gas exhaust temperature at the lower end of the design range (i.e. 125°C) in all load cases. The resulting emissions rates are provided in Table 66.

Table 64 Upper emissions limits from the WI BREF

Substance		Air emissions standard to be met (mg/nm ³ calculated at 273.15k, 101.3 kpa, 11% O ₂)
PM	Dust	5
HCL	Hydrogen chloride	6
HF	Hydrogen fluoride	1
SO ₂	Sulphur dioxide	30
NO _x	Oxides of nitrogen	120
CO	Carbon monoxide	50
NH ₃	Ammonia	10
Cd + Tl		0.02
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V		0.30
Hg	Mercury	20
TVOCs	Total Volatile Organic Compound (TVOC)	10
PCDD/F TEQ	PCDD/F mg I-TEQ/Nm ³	0.00000004
PCDD/F + PCB	PCDD/F + dioxin like PCB mg WHO-TEQ/Nm ³	0.00000006

Table 65 Speciation of the cumulative WI BREF heavy metal upper limits

Substance		European union, 2010, directive 2010/75/eu	Air emissions standard to be met (mg/nm ³ calculated at 273.15k, 101.3 kpa, 11% o ₂)
		Percentage split	Total (from Table 64) 0.30
Sb	Antimony	11%	0.033
As	Arsenic	1%	0.003
Pb	Lead	59%	0.177
Cr	Chromium	2%	0.006
Co	Cobalt	1%	0.003
Cu	Copper	13%	0.039
Mn	Manganese	11%	0.033
Ni	Nickel	1%	0.003
V	Vanadium	1%	0.003
		Percentage split	Total (from Table 64) 0.02
Cd	Cadmium	88%	0.0175
Tl	Thallium	13%	0.0025

Note: The NSW Best Practice Emissions Limits for EfW facilities specify an upper limit for mercury of 0.04 mg/m³, significantly lower than the 20 mg/Nm³ (~9.2 mg/m³) specified in the BREF.

Table 66 Estimated emissions rates (per boiler flue) for the ARRC Residual WtE facility

Substance		Emissions Rates Per Boiler Flue (Mg/Nm3 Calculated At 273.15 K, 101.3 Kpa, 11% O2)				Emissions Rates Per Boiler Flue (G/S) At 398.15 K (125 °C)			
		Maximum Load (110%)	Normal Load (100%)	Low Load (60%)	Minimum Load (60%)	Maximum Load (110%) at 6.2% O ₂	Normal Load (100%) At 6.3% O ₂	Low Load (60%) at 7.9% O ₂	Minimum Load (60%) at 7.9% O ₂
CO	Carbon Monoxide	50.0	45.45	27.27	27.27	2.44	2.00	0.90	0.90
NO _x	Nitrogen Oxides as Nitrogen Dioxide	120.0	109.09	65.45	65.45	5.85	4.80	2.15	2.15
SO ₂	Sulphur Dioxide	30.0	27.27	16.36	16.36	1.46	1.20	0.54	0.54
HCL	Chlorine as HCL	6.0	5.45	3.27	3.27	0.29	0.24	0.11	0.11
HF	Fluorine as HF	1.0	0.91	0.55	0.55	0.05	0.04	0.02	0.02
NH ₃	Ammonia	5.0	4.55	2.73	2.73	0.24	0.20	0.09	0.09
VOCs	Volatile Organic Compounds	10.0	9.09	5.45	5.45	0.49	0.40	0.18	0.18
PM	PM (total)	5.0	4.55	2.73	2.73	0.24	0.20	0.09	0.09
PM ₁₀	PM ₁₀	5.0	4.55	2.73	2.73	0.24	0.20	0.09	0.09
PM _{2.5}	PM _{2.5}	5.0	4.55	2.73	2.73	0.24	0.20	0.09	0.09
PCDD/F TEQ	PCDD/F TEQ*	4.00E-08	3.64E-08	2.18E-08	2.18E-08	1.95E-09	1.60E-09	7.16E-10	7.18E-10
Sb	Antimony	3.30E-02	3.00E-02	1.80E-02	1.80E-02	1.61E-03	1.32E-03	5.91E-04	5.92E-04
As	Arsenic	3.00E-03	2.73E-03	1.64E-03	1.64E-03	1.46E-04	1.20E-04	5.37E-05	5.39E-05

Substance		Emissions Rates Per Boiler Flue (Mg/Nm3 Calculated At 273.15 K, 101.3 Kpa, 11% O2)				Emissions Rates Per Boiler Flue (G/S) At 398.15 K (125 °C)			
		Maximum Load (110%)	Normal Load (100%)	Low Load (60%)	Minimum Load (60%)	Maximum Load (110%) at 6.2% O ₂	Normal Load (100%) At 6.3% O ₂	Low Load (60%) at 7.9% O ₂	Minimum Load (60%) at 7.9% O ₂
Pb	Lead	1.77E-01	1.61E-01	9.65E-02	9.65E-02	8.64E-03	7.09E-03	3.17E-03	3.18E-03
Cr	Chromium	6.00E-03	5.45E-03	3.27E-03	3.27E-03	2.93E-04	2.40E-04	1.07E-04	1.08E-04
Co	Cobalt	3.00E-03	2.73E-03	1.64E-03	1.64E-03	1.46E-04	1.20E-04	5.37E-05	5.39E-05
Cu	Copper	3.90E-02	3.55E-02	2.13E-02	2.13E-02	1.90E-03	1.56E-03	6.99E-04	7.00E-04
Mn	Manganese	3.30E-02	3.00E-02	1.80E-02	1.80E-02	1.61E-03	1.32E-03	5.91E-04	5.92E-04
Ni	Nickel	3.00E-03	2.73E-03	1.64E-03	1.64E-03	1.46E-04	1.20E-04	5.37E-05	5.39E-05
V	Vanadium	3.00E-03	2.73E-03	1.64E-03	1.64E-03	1.46E-04	1.20E-04	5.37E-05	5.39E-05
Hg	Mercury	20	18.18	10.91	10.91	0.98	0.80	0.36	0.36
Cd	Cadmium	1.75E-02	1.59E-02	9.55E-03	9.55E-03	8.54E-04	7.01E-04	3.13E-04	3.14E-04
Tl	Thallium	2.50E-03	2.27E-03	1.36E-03	1.36E-03	1.22E-04	1.00E-04	4.48E-05	4.49E-05

In addition, the ARRC precinct the following sources of notable air emissions are either existing or approved to exist within the surrounding airshed:

- Stapylton Resources Recovery Facility (existing)
- Stapylton Landfill (existing)
- Stapylton Renewable Energy Facility (existing)
- Visy Glass (approved)
- Boral Concrete (existing with material change of use approved)

Relative Emissions Contributions

Of the total emissions estimated, the Residual WtE boiler flues contribute:

- Less than 10% to TSP (dust), chromium and nickel
- Less than 30% to SO₂ and PM₁₀
- Less than 50% to CO, NO_x, PM_{2.5}, VOCs and lead.

The Residual WtE boiler flues estimated emissions constitute the majority (i.e. > 50%) of HCL, HF, NH₃, PCDD, antimony, arsenic, cadmium, cobalt, copper, manganese, mercury, thallium, and vanadium. The SRRF and Stapylton contribute significantly higher proportions of TSP, PM₁₀ and PM_{2.5} emissions compared to the Residual WtE facility, while the proposed Visy Glass operations are the primary source SO₂, lead, chromium and nickel.

Dispersion Modelling

A CALPUFF dispersion model was used to simulate the effects of time and space varying meteorological conditions on pollutant transport. The model consists of three main components:

- CALMET, a diagnostic 3-dimensional meteorological model
- CALPUFF, an air quality dispersion model
- CALPOST, a post-processing model

In order to capture important coastal induced flows, CALMET was used to develop a 3-dimensional hourly gridded meteorological domain. Inputs into CALMET included fine-scale terrain (150m resolution) and detailed fine scale land use as well as surface observation meteorological data and prognostic model upper air data from CSIRO's TAPM. The latest versions of the models were used in this analysis; CALMET Version 6.5.0 (Level 150223), CALPUFF Version 7.2.1 (Level 150608) and TAPM Version 4.05.

Scenarios

A sensitivity analysis was undertaken to determine the impact of the Residual WtE facility emissions at various stack heights within the design range of 80 – 100 m, under various load scenarios. This included:

- Maximum load emissions at 80 m, 90 m and 100 m.
- Normal load emissions at 80 m.

Based on the results of the sensitivity analysis, two of the following scenarios were selected for cumulative assessment:

- Maximum load emissions at 80 m
- Normal load emissions at 80 m

Results

Incremental impacts

A sensitivity analysis was undertaken to determine the impact of the stack height and load conditions on the dispersion potential of the Residual WtE facility emissions. Various stack heights within the design range of 80 – 100 m were modelled under two load scenarios. This included:

- Maximum load emissions (assuming the BREF upper limits represent 110% load) at 80 m, 90 m and 100 m.
- Normal load emissions (at 100% load) at 80 m.

In each scenario, the maximum concentration reported at any discrete receptor was selected and the difference between them calculated. Table 67 presents a summary of these results, expressed as the percentage difference per averaging period.

The results show predicted concentrations at the receptors are higher under the maximum load scenario compared to the normal load scenario (at 80 m). Short term (1-hr) concentrations are 14% to 20% higher under the *maximum load* scenario, while longer term (24-hr and annual) concentrations range from 11% to 15% higher. These figures serve as indicative statistics only, as the boilers will not operate at >105% for more than a few minutes at any given time. As expected, predicted ground level concentrations at the receptors decrease as stack height increases. The amount by which it decreases varies significantly between receptors and averaging periods due to the variability in wind fields at the different heights.

Table 68 provides the maximum predicted concentrations at receptors for each scenario, expressed as a percentage of the assessment criteria. Ground level concentrations at all receptors are predicted to remain well below (i.e. < 50%) the respective assessment criteria under all scenarios considered. In all scenarios:

- As, 1-hour Cd, CO, Co, Cr, Cu, HCl, Hg, Mn, NH₃, Ni, Pb, PCDD, PM (TSP), PM₁₀, annual PM_{2.5}, Sb, annual SO₂, Ti, V, and VOCs remained less than 3% of the criteria at all receptors.
- Predicted 24-hour and annual Cr, 30- and 90-day HF, 1-hour and 24-hour SO₂, and 24-hour PM_{2.5} ranged from 5% to 15% of the criteria.
- 24-Hour HF and 1-hour NO₂ reached a maximum of 29% and 44% of the criteria respectively.

Note: The maximum load scenarios are considered “upset” conditions and assume both boilers are operating at 110%. These are highly conservative scenarios as the boilers will not operate at >105% for more than a few minutes at any given time. Furthermore, it is highly unlikely that both boilers will operate at >105% simultaneously.

Table 67 Results of the sensitivity analysis

	Normal vs. Maximum Load at 80 m	Maximum load at 80 m vs 90 m	Maximum load at 100 m vs 90 m
Difference in maximum concentration predicted at a school			
1-hr	20%	-9%	-6%
24-hr	12%	-0.4%	<1%
Annual	11%	-4%	-2%
Difference in maximum concentration predicted at a residential area			
1-hr	16%	-13%	-39%
24-hr	15%	-27%	<1%
Annual	12%	-4%	-2%
Difference in maximum concentration predicted at a workplace			
1-hr	14%	-18%	-26%
24-hr	12%	-17%	-9%
Annual	12%	-20%	-2%
Difference in maximum concentration predicted at an ecosystem			
1-hr	17%	-21%	-23%
24-hr	14%	-27%	-27%
Annual	14%	-30%	-12%
Difference in maximum concentration predicted at an agricultural receptor			
1-hr	16%	-25%	-31%
24-hr	13%	-39%	-38%
Annual	14%	-30%	-54%

Table 68 Predicted maximum concentrations at receptors under various load and stack height scenarios, expressed as a percentage of the assessment criteria

		Receptor	School				Residential				Workplace				Ecosystem				Agriculture			
		Load	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum
		Stack height	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m
Substance	Period	Criteria (µg/m3)	Percentage of Criteria																			
As	Annual	0.006	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	1%	1%	1%	0%
Cd	1-hr	18	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Cd	24-hr	0.03	7%	8%	8%	8%	10%	12%	9%	9%	12%	13%	11%	10%	11%	12%	9%	7%	12%	14%	8%	5%
Cd	Annual	0.005	5%	6%	6%	6%	5%	6%	6%	6%	7%	8%	6%	6%	5%	5%	4%	3%	5%	6%	4%	2%
CO	8-hr	11,000	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Co	Annual	0.1	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Cr	1-hr	1.3	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Cr	Annual	0.005	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	2%	2%	2%	2%	1%	1%	2%	2%	1%	1%
Cu	1-hr	100	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%

		Receptor	School				Residential				Workplace				Ecosystem				Agriculture			
		Load	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum
		Stack height	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m
HCL	1-hr	2100	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
HCL	Annual	20	<1%	1%	<1%	<1%	<1%	1%	<1%	<1%	1%	1%	1%	1%	<1%	<1%	<1%	<1%	<1%	1%	<1%	<1%
HF	90-days	0.25	9%	10%	10%	10%	9%	10%	10%	10%	13%	15%	12%	12%	9%	11%	7%	6%	10%	11%	8%	4%
HF	24-hr	0.8	16%	18%	18%	18%	22%	26%	19%	19%	25%	28%	24%	21%	23%	26%	19%	14%	26%	29%	18%	11%
HF	30-days	0.4	8%	9%	9%	9%	8%	10%	9%	9%	13%	14%	11%	11%	8%	10%	7%	5%	9%	10%	7%	3%
Hg	Annual	1	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Mn	Annual	0.16	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
NH ₃	1-hr	3200	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
NH ₃	24-hr	1184	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
NH ₃	Annual	70	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Ni	Annual	0.022	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%

		Receptor	School				Residential				Workplace				Ecosystem				Agriculture			
		Load	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum
		Stack height	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m
NO ₂	1-hr	164	21%	25%	23%	22%	38%	44%	38%	23%	38%	43%	35%	26%	34%	40%	31%	24%	32%	38%	28%	19%
NO ₂	Annual	31	6%	6%	6%	6%	6%	6%	6%	6%	8%	9%	7%	7%	5%	6%	4%	4%	6%	7%	5%	2%
Pb	Annual	0.5	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	<1%	1%	<1%	<1%	1%	1%	<1%	<1%
PCDD	1-hr	0.000002	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
PCDD	Annual	0.00004	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
PM (TSP)	Annual	90	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
PM ₁₀	24-hr	50	1%	1%	1%	1%	2%	2%	1%	1%	2%	2%	2%	2%	2%	2%	2%	1%	2%	2%	1%	1%
PM ₁₀	Annual	25	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
PM _{2.5}	24-hr	20	3%	4%	4%	4%	4%	5%	4%	4%	5%	6%	5%	4%	5%	5%	4%	3%	5%	6%	4%	2%
PM _{2.5}	Annual	7	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%
Sb	24-hr	1	<1%	<1%	<1%	<1%	1%	1%	<1%	<1%	1%	1%	1%	1%	1%	1%	1%	<1%	1%	1%	<1%	<1%

		Receptor	School				Residential				Workplace				Ecosystem				Agriculture			
		Load	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum
		Stack height	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m
Sb	Annual	0.3	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
SO ₂	1-hr	214	4%	5%	4%	4%	7%	8%	7%	4%	7%	8%	7%	5%	7%	8%	6%	5%	6%	7%	5%	4%
SO ₂	24-hr	57	7%	8%	8%	8%	9%	11%	8%	8%	11%	12%	10%	9%	10%	11%	8%	6%	11%	12%	8%	5%
SO ₂	Annual	21	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	2%	2%	2%	1%	2%	2%	2%	1%
TI	1-hr	1	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
TI	Annual	0.1	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
V	24-hr	1.1	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
VOCs	Annual	5.4	3%	3%	3%	3%	3%	3%	3%	3%	4%	4%	3%	3%	3%	3%	2%	2%	3%	3%	2%	1%

A colour gradient is applied, ranging from light blue at 0% to red at 100% of the criteria. Note that NO₂ is conservative and will likely be lower.

Cumulative impacts

Cumulative impacts were initially assessed by adding the predicted concentrations to regional background concentrations sourced from monitoring stations and various reports. However, many of the pollutants modelled are not currently measured and representative background concentrations were not available. Furthermore, the current emitters within the airshed will change by the time the Residual WtE facility is commissioned in 2032. Subsequent dispersion simulations were therefore run including the nearby emissions sources estimated.

Table 69 presents the maximum cumulative impact of the Residual WtE Facility at the receptors using available regional background air quality data. No exceedances of the assessment criteria were calculated in any scenario considered. Short-term (1-hour) NO₂ concentrations reached a maximum of 88% of the criterion, however this is considered highly conservative as a 1:1 conversion ratio was adopted, assuming 100% of the NO is converted to NO₂. It is recommended that the incremental and cumulative NO₂ concentrations are re-considered once local ambient ozone (O₃) concentrations, currently being measured on site, become available. Ambient O₃ concentrations are used in the Ozone Limiting Method (OLM) (in accordance with *NSW Approved Methods, 2022*) to approximate the conversion of NO to NO₂. It assumes that all the available O₃ in the atmosphere will react with the NO from the source until either all the O₃ is consumed, or all the NO is used up. It is anticipated that predicted NO₂ concentrations will be reduced using this method.

While the Residual WtE facility's contribution to PM_{2.5} and VOC concentrations is relatively small (<5% of the criteria), the high annual background concentrations (73% and 64% of the criteria respectively), result in elevated cumulative concentrations between 65% and 75% of the assessment criteria.

Table 69 Maximum cumulative impact of the Residual WtE Facility at the receptors using regional background air quality data (where available)

			Receptor type	School				Residential				Workplace				Ecosystem				Agriculture			
			Load	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum
			Stack height	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m
Substance	Period	Criteria (µg/m3)	Background (µg/m3)	Percentage of criteria																			
As	Annual	0.006	0.0003	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	5%	6%	6%	6%	5%
Cd	1-hr	18	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Cd	24-hr	0.03	0.0004	9%	10%	10%	10%	12%	13%	10%	10%	13%	15%	12%	11%	12%	14%	10%	8%	13%	15%	10%	7%
Cd	Annual	0.005	0.0001	7%	8%	8%	8%	7%	8%	8%	8%	9%	10%	8%	8%	7%	7%	6%	5%	7%	8%	6%	4%
CO	8-hr	11000	1293.62	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Co	Annual	0.1	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Cr	1-hr	1.3	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Cr	Annual	0.005	-*	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	2%	2%	2%	2%	1%	1%	2%	2%	1%	1%
Cu	1-hr	100	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
HCl	1-hr	2100	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
HCl	Annual	20	-*	<1%	1%	<1%	<1%	<1%	1%	<1%	<1%	1%	1%	1%	1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
HF	90-days	0.25	-*	9%	10%	10%	10%	9%	10%	10%	10%	13%	15%	12%	12%	9%	11%	7%	6%	10%	11%	8%	4%
HF	24-hr	0.8	-*	16%	18%	18%	18%	22%	26%	19%	19%	25%	28%	24%	21%	23%	26%	19%	14%	26%	29%	18%	11%
HF	30-days	0.4	0.11	36%	37%	36%	36%	36%	37%	37%	36%	40%	42%	39%	38%	36%	37%	34%	32%	37%	38%	35%	31%
Hg	Annual	1	0.0001	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Mn	Annual	0.16	0.0027	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
NH3	1-hr	3200	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
NH3	24-hr	1184	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
NH3	Annual	70	-*	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%

				Receptor type	School				Residential				Workplace				Ecosystem				Agriculture			
				Load	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum	Normal	Maximum	Maximum	Maximum
				Stack height	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m	80 m	80 m	90 m	100 m
Ni	Annual	0.022	-*		<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
NO ₂	1-hr	164	72.86		65%	70%	67%	66%	82%	88%	83%	68%	82%	88%	80%	71%	78%	84%	76%	69%	77%	82%	72%	64%
NO ₂	Annual	31	9.54		37%	37%	37%	37%	37%	37%	37%	37%	39%	40%	38%	38%	36%	37%	35%	34%	36%	37%	35%	33%
Pb	Annual	0.5	0.0033		1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
PCDD	1-hr	0.000002	-*		1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
PCDD	Annual	0.00004	-*		<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
PM (TSP)	Annual	90	23		26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%
PM (TSP)	1-month	120 mg/m2/day	-*		<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
PM ₁₀	24-hr	50	18		37%	37%	37%	37%	38%	38%	37%	37%	38%	38%	38%	38%	38%	38%	38%	37%	38%	38%	37%	37%
PM ₁₀	Annual	25	11		44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%	44%
PM _{2.5}	24-hr	20	8.1		44%	44%	44%	44%	45%	46%	44%	44%	46%	46%	45%	45%	45%	46%	44%	43%	46%	46%	44%	43%
PM _{2.5}	Annual	7	5.1		74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	73%
Sb	24-hr	1	-*		<1%	<1%	<1%	<1%	1%	1%	<1%	<1%	1%	1%	1%	1%	1%	1%	1%	<1%	1%	1%	<1%	<1%
Sb	Annual	0.3	-*		<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
SO ₂	1-hr	214	31.44		19%	20%	19%	19%	22%	23%	22%	19%	22%	23%	21%	20%	21%	22%	21%	19%	21%	22%	20%	18%
SO ₂	24-hr	57	5.72		17%	18%	18%	18%	19%	21%	18%	18%	21%	22%	20%	19%	20%	21%	18%	16%	21%	22%	18%	15%
SO ₂	Annual	21	0.91		6%	7%	7%	7%	6%	7%	7%	7%	7%	8%	7%	7%	6%	7%	6%	6%	6%	7%	6%	5%
TI	1-hr	1	-*		<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
TI	Annual	0.1	-*		<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
V	24-hr	1.1	0.0002		<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
VOCs	Annual	5.4	3.48		67%	68%	67%	67%	67%	68%	67%	67%	68%	69%	68%	68%	67%	67%	66%	66%	67%	68%	67%	65%

A colour gradient is applied, ranging from light blue at 0% to red at 100% of the criteria. * Pollutants with no monitoring data available are assumed to be a negligible background concentration

Cumulative dispersion modelling

Based on the results of the incremental and regional background assessments, the “worst-case” scenarios i.e. normal and maximum loads at 80 m, were selected for cumulative dispersion modelling. The Residual WtE facility was modelled together with the existing sources. Table 70 presents the resulting maximum predicted cumulative concentrations.

While long-term cumulative NO₂ concentrations are predicted to reach a maximum of 36% of the criterion, short-term (1-hour) NO₂ concentrations are predicted to exceed the criterion by a maximum of 17% at receptors #11 (AWLQ Beenleigh Animal Rehoming Centre) and #12 (the City Pound at Stapylton) as a result of their proximity to the SREF gas engine(s) (~120 m). Concentrations remained below the criterion at all remaining receptors. Again, it must be noted that this is considered highly conservative as a 1:1 NO to NO₂ conversion ratio was adopted. It is recommended that these cumulative NO₂ concentrations are re-considered once local ambient ozone (O₃) concentrations, currently being measured on site, become available and the OLM can be applied. It is anticipated that predicted NO₂ concentrations will be reduced using this method.

24-hour PM₁₀ concentrations are predicted to exceed the criterion by 10% at one receptor: #85 at 197 Rossmanns Road. This was attributed to the proximity of the receptor (i.e. less than 100 m) to the primary source of fugitive particulate matter: the SRRF operations. All remaining substances remained below the relevant assessment criteria at all receptors for both the normal and maximum load cases. Selected contour plots are provided in Appendix C for substances with a predicted cumulative concentration >50% of the assessment criteria. It must be noted that there is little difference (< 4%) between the predicted cumulative concentrations under the normal and maximum load scenarios due to the relatively low contribution of the Residual WtE facility to total emissions compared to the existing sources. Furthermore, it is likely that the emissions from the existing sources are overestimated, relying entirely on broad emissions factors to characterise highly variable processes. Background monitoring is currently underway which will provide a better understanding of the site-specific receiving environment and the cumulative impact of the ARRC project on local ambient air quality. It is recommended that the cumulative impact is re-assessed once local monitoring data becomes available.

Table 70 Maximum predicted cumulative concentrations at receptors under normal and maximum loads assuming an 80 m stack height.

		Receptor	School			Residential			Workplace			Ecosystem			Agriculture		
		Load	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ
Substance	Period	Criteria μg/m ³	Percentage of criteria														
As	Annual	0.006	2%	2%	0%	1%	2%	0%	3%	3%	0%	2%	2%	0%	1%	1%	0%
Cd	1-hr	18	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
Cd	24-hr	0.03	7%	8%	1%	10%	12%	2%	12%	13%	1%	11%	13%	1%	12%	14%	2%
Cd	Annual	0.005	7%	7%	1%	6%	7%	1%	9%	9%	1%	5%	6%	1%	6%	6%	1%
CO	8-hr	11,000	1%	1%	0%	1%	1%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Co	Annual	0.1	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
Cr	1-hr	1.3	5%	5%	0%	5%	5%	0%	6%	6%	0%	3%	3%	0%	3%	3%	0%
Cr	Annual	0.005	21%	21%	0%	20%	20%	0%	73%	73%	0%	36%	37%	0%	12%	13%	0%
Cu	1-hr	100	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
HCl	1-hr	2,100	<1%	<1%	0%	<1%	<1%	0%	1%	1%	0%	<1%	<1%	0%	<1%	<1%	0%
HCl	Annual	20	1%	1%	0%	1%	1%	0%	3%	3%	0%	1%	1%	0%	1%	1%	0%
HF	90-days	0.25	16%	17%	1%	16%	17%	1%	43%	44%	1%	22%	23%	1%	13%	14%	1%
HF	24-hr	0.8	29%	29%	0%	23%	26%	3%	53%	53%	0%	40%	41%	0%	26%	29%	3%
HF	30-days	0.4	11%	12%	1%	11%	12%	1%	30%	30%	1%	16%	17%	1%	12%	13%	1%
Hg	Annual	1	30%	34%	3%	30%	34%	4%	40%	45%	5%	27%	31%	4%	30%	34%	4%

		Receptor	School			Residential			Workplace			Ecosystem			Agriculture		
		Load	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ
Substance	Period	Criteria µg/m ³	Percentage of criteria														
Mn	Annual	0.16	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
NH ₃	1-hr	3,200	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
NH ₃	24-hr	1,184	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
NH ₃	Annual	70	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
Ni	Annual	0.022	4%	4%	0%	4%	4%	0%	14%	14%	0%	7%	7%	0%	2%	2%	0%
NO ₂	1-hr	164	67%	67%	0%	77%	77%	0%	117%	117%	0%	47%	50%	3%	35%	40%	4%
NO ₂	Annual	31	18%	18%	1%	16%	17%	1%	36%	36%	0%	19%	19%	1%	11%	12%	1%
Pb	Annual	0.5	1%	1%	0%	1%	1%	0%	3%	3%	0%	2%	2%	0%	1%	1%	0%
PCDD	1-hr	0.000002	2%	2%	0%	2%	2%	0%	6%	6%	0%	1%	1%	0%	1%	1%	0%
PCDD	Annual	0.00004	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
PM (TSP)	Annual	90	3%	3%	0%	13%	13%	0%	21%	21%	0%	8%	8%	0%	7%	7%	0%
PM (TSP)	1-month	120 mg/m2/day	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
PM ₁₀	24-hr	50	19%	19%	0%	110%	110%	0%	82%	82%	0%	85%	85%	0%	64%	64%	0%
PM ₁₀	Annual	25	5%	5%	0%	16%	16%	0%	28%	28%	0%	12%	12%	0%	9%	9%	0%
PM _{2.5}	24-hr	20	7%	7%	0%	44%	44%	0%	33%	33%	0%	34%	34%	0%	25%	25%	0%
PM _{2.5}	Annual	7	4%	4%	0%	9%	9%	0%	16%	16%	0%	7%	7%	0%	5%	5%	0%

		Receptor	School			Residential			Workplace			Ecosystem			Agriculture		
		Load	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ	Normal	Maximum	Δ
Substance	Period	Criteria µg/m ³	Percentage of criteria														
Sb	24-hr	1	<1%	<1%	0%	1%	1%	0%	1%	1%	0%	1%	1%	0%	1%	1%	0%
Sb	Annual	0.3	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
SO ₂	1-hr	214	44%	44%	0%	42%	42%	0%	51%	51%	0%	25%	25%	0%	23%	23%	0%
SO ₂	24-hr	57	39%	39%	0%	23%	23%	0%	70%	70%	0%	50%	50%	0%	17%	17%	0%
SO ₂	Annual	21	8%	9%	0%	8%	8%	0%	26%	26%	0%	13%	13%	0%	5%	6%	0%
TI	1-hr	1	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
TI	Annual	0.1	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
V	24-hr	1.1	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%	<1%	<1%	0%
VOCs	Annual	5.4	8%	8%	0%	50%	50%	0%	83%	83%	0%	33%	33%	0%	25%	25%	0%

A colour gradient is applied, ranging from light blue at 0% to red at 100% of the criteria.

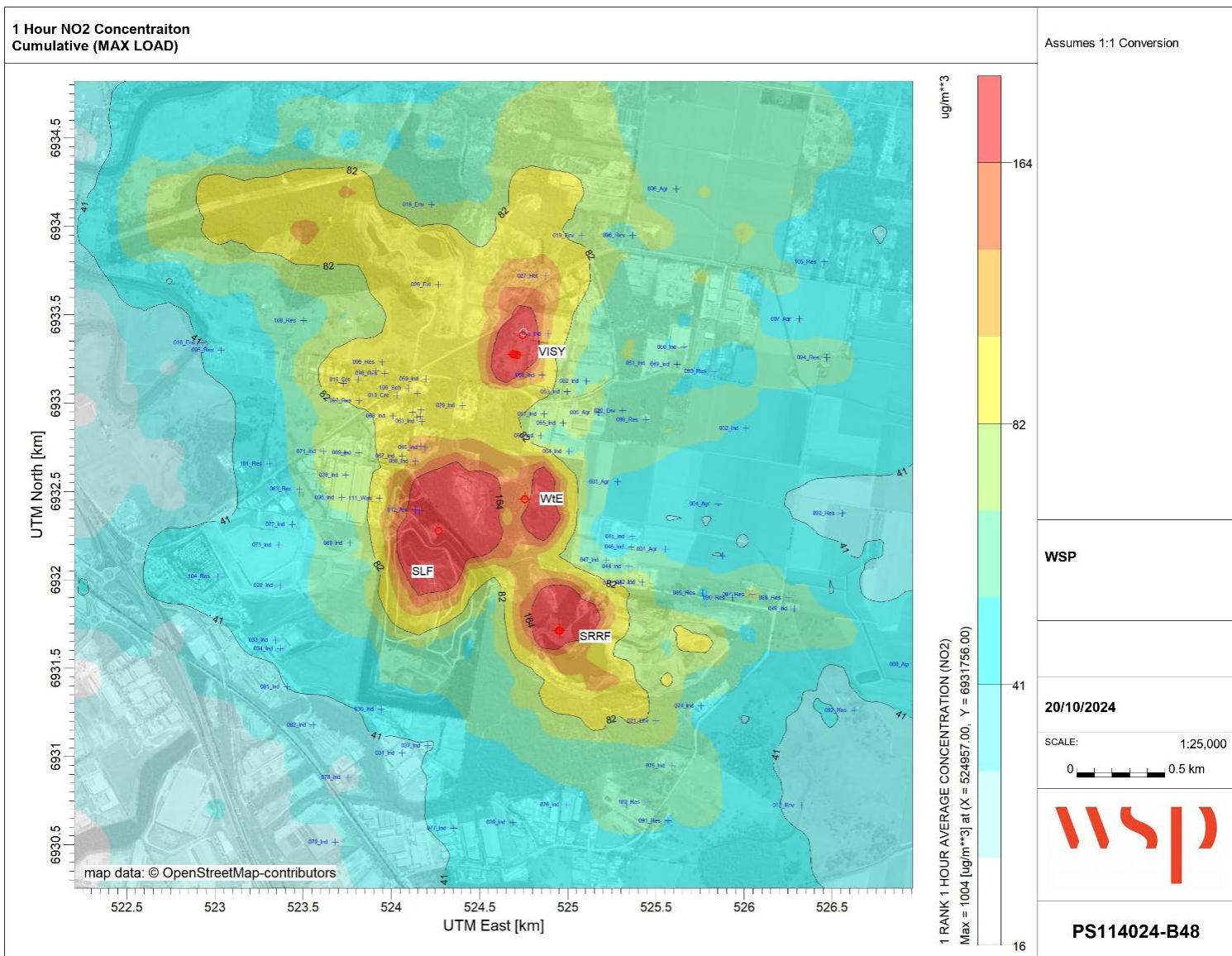


Figure 32 Predicted cumulative 1-hour average NO₂ concentrations, assuming the Residual WtE facility is operating at maximum load, with a stack height of 80 m

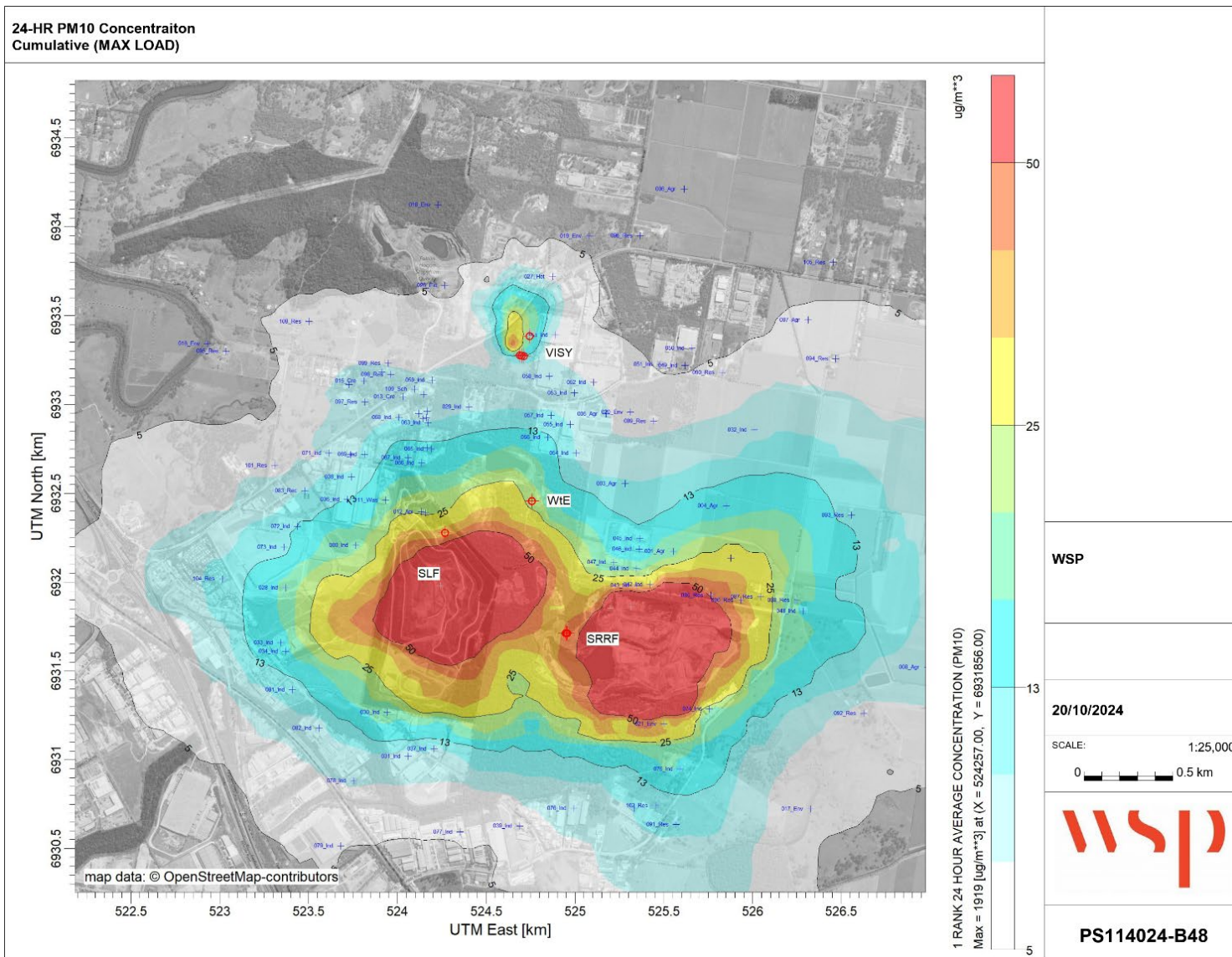


Figure 33 Predicted cumulative 24-hour average PM₁₀ concentrations, assuming the Residual WtE facility is operating at maximum load, with a stack height of 80 m

Mitigation and Management

The following subsections describe mitigation and management measures to be considered in the design as it progresses.

Emissions Control

Emission control measures include:

- Enclosed tipping hall – negative pressure may also assist in reducing emissions.
- Designing a facility with two thermal processing units (boilers) to allow continued operation of one boiler when the second boiler is undergoing maintenance or subject to an emergency shut down.
- The waste receival bunker is designed in such a way that it can provide the storage capacity of the waste to operate the plant for between 5 and 7 days in case of waste supply chain disturbance.
- The thermal treatment (Controlled Combustion) process is maintained well above 850°C for at least 2 seconds residence time to ensure the destruction of VOCs, dioxins and furans and other organic compounds
- SNCR for NO_x abatement using Ammonia or Urea as a reagent
- Activated carbon injection to adsorb heavy metals such and dioxins/furans and metallic components such as mercury
- Fabric filter for dust and particulate matter removal
- Dry or Semi-Dry Scrubber for acidic gaseous removal
- Fully enclosed ash handling and facilities
- Final control equipment will be designed by the vendor as required to achieve the proposed emission limits that this assessment is based on.

Ambient Air Quality Monitoring

A 12-month ambient air quality monitoring program is currently underway at the ARRC site (location). The purpose of the program is to understand the seasonal background concentrations for key assessment pollutants PM₁₀, PM_{2.5}, heavy metals in particulates, NO₂ and O₃.

The following instruments are currently in use:

- Particulate Matter – PM₁₀ Beta Attenuation Monitor (BAM) in accordance with AS3580.9.12
- Particulate Matter – PM_{2.5} Beta Attenuation Monitor (BAM) in accordance with AS3580.9.11
- Oxides of Nitrogen – NO and NO₂ with a Chemiluminescence NO/NO₂/NO_x Analyser in accordance with AS3580.5.1
- Ozone (O₃) with a UV Absorption O₃ Analyser in accordance with AS3580.6.1

-
- Monitoring station calibration system with a dilution calibrator, zero air generator and calibration gas.
 - Meteorological parameters, including wind speed, wind direction, temperature, relative humidity, atmospheric pressure and rainfall
 - In addition to the monitoring station, a particulate gravimetric sampler takes gravimetric particulate samples for heavy metals analysis once a quarter.

A similar program will be implemented post-commissioning of the Residual WtE facility for a period of at least one 12-month period.

Emissions Monitoring

Once commissioned, in-stack emissions from the Residual WtE facility will be monitored through Continuous Emissions Monitoring Systems (CEMS) and isokinetic “grab” sampling. BAT 3 and BAT 4 of the WI BREF make specific recommendations for monitoring process performance and channelled emissions to air, providing minimum sampling frequencies and applicable EN and ISO standards. To ensure effective monitoring of channelled emissions to air from the Residual WtE facility during Other Than Normal Operating Conditions (OTNOC), BAT 5 recommends:

- **Direct Emission Measurements:** Continuous monitoring of specific pollutants directly emitted from the plant.
- **Surrogate Parameter Monitoring:** Utilization of surrogate parameters for monitoring, provided they offer equivalent or superior scientific accuracy compared to direct measurements.

For emissions occurring during start-up and shutdown phases, when no waste is being incinerated (including emissions of PCDD/F), estimates should be based on measurement campaigns conducted during planned start-up/shutdown operations, typically every three years.

Summary and Conclusions

Each potential source of air emissions from the proposed ARRC has been evaluated, with the Residual WtE facility's boiler flues identified as the primary source of air emissions (excluding odour). The Residual WtE facility is being designed in accordance with the WI BREF, employing engineering controls to ensure emissions do not exceed the specified upper limits. These limits, along with design parameters, were used to estimate emission rates under various load conditions.

CALPUFF modelling was conducted for maximum and normal operating loads, assuming stack heights of 80, 90, and 100 meters to assess the impact of stack height on ground-level concentrations. The results of this sensitivity analysis indicated that increased stack height enhances dispersion, thereby reducing ground-level pollutant concentrations at receptors. The degree of reduction varied significantly between receptors and averaging periods due to wind field variability at different heights. Ground-level concentrations at all receptors were predicted to remain well below 50% of the respective assessment criteria under all scenarios.

These predicted incremental concentrations were added to regional background concentrations sourced from the closest monitoring stations and industry reports to calculate the cumulative impact of the Residual WtE facility. Short-term (1-hour) NO₂ concentrations reached a maximum of 88% of the criterion, however this was

considered highly conservative as a 1:1 conversion ratio was adopted, assuming 100% of the NO is converted to NO₂. While the Residual WtE facility's contribution to PM_{2.5} and VOC concentrations was relatively small (<5% of the criteria), the high annual background concentrations (73% and 64% of the criteria respectively), resulted in elevated cumulative concentrations between 65% and 75% of the assessment criteria.

Many pollutants modelled are not currently measured in ambient monitoring and, therefore, representative background concentrations were unavailable. Emissions from existing sources within the airshed will change by the time the Residual WtE facility is commissioned in 2032. Subsequent cumulative dispersion simulations included nearby emission sources such as the BMI SRRF, Stapylton Landfill, and Visy Glass (under construction). Emission rates for these sources were sourced from publicly available AQIAs and NPI emissions reports.

In comparing the relative emissions contributions of the Residual WtE Facility and additional sources, it was found that of the total emissions estimated, the Residual WtE boiler flues contribute less than 10% to TSS (dust), chromium and nickel, less than 30% to SO₂, PM₁₀ and PM_{2.5}, and less than 50% to CO, NO_x, VOCs and lead within the airshed. The Residual WtE boiler flues estimated emissions constitute the majority (i.e. > 50%) of HCL, HF, NH₃, PCDD, antimony, arsenic, cadmium, cobalt, copper, manganese, mercury, thallium, and vanadium. The SRRF and Stapylton contributed significantly higher proportions of TSS, PM₁₀ and PM_{2.5} emissions compared to the Residual WtE facility, while the proposed Visy Glass operations were the primary source SO₂, lead, chromium and nickel.

The cumulative dispersion modelling showed that while long-term (annual) cumulative NO₂ concentrations were predicted to reach a maximum of 36% of the criterion, short-term (1-hour) NO₂ concentrations were predicted to exceed the criterion by a maximum of 17% at receptors #11 (AWLQ Beenleigh Animal Rehoming Centre) and #12 (the Stapylton City Pound) as a result of their proximity to the SREF gas engine(s) (~120 m). NO₂ concentrations remained below the criterion at all remaining receptors. Again, it must be noted that this is considered highly conservative as a 1:1 NO to NO₂ conversion ratio was adopted. 24-hour PM₁₀ concentrations were predicted to exceed the criterion by 10% at one receptor: #85 at 197 Rossmanns Road, located less than 100 m from the primary source of TSS: the BMI SRRF.

All remaining substances remained below the relevant assessment criteria at all receptors for both the normal and maximum load cases. It must be noted that there was little difference (< 4%) between the predicted cumulative concentrations under the normal and maximum load scenarios due to the relatively low contribution of the Residual WtE facility to total emissions compared to the existing sources. These cumulative NO₂ concentrations will be re-considered once local ambient ozone (O₃) concentrations, currently being measured on site, become available and the OLM can be applied. It is anticipated that predicted NO₂ concentrations will be reduced using this method. Furthermore, it is likely that the emissions from the existing sources are overestimated, relying entirely on broad emissions factors to characterise highly variable processes. Background monitoring is currently underway which will provide a better understanding of the site-specific receiving environment and the cumulative impact of the ARRC project on local ambient air quality. Cumulative impact will be re-assessed once local monitoring data becomes available.

Based on the results of this assessment, the proposed ARRC project does not pose and unacceptable risk to local ambient air quality. Changes to the proposed design may result in different emissions and dispersion potentials, the impact of which would be considered through an updated air quality impact assessment.

4.8 Noise and Vibration

4.8.1 Introduction and Scope

The ARRC project will comprise eight individual precincts, along with ancillary infrastructure, that will perform different intensities of waste management and community education functions (refer to Table 14). Construction of the ARRC will be staged, with each precinct being built, commissioned, and becoming operational at varying time scales between 2026 and 2032 (refer to Table 14 for more information on the current staging plan). Part of the planning of the ARRC includes developing an initial understanding of the potential noise and vibration impacts that the construction of the site may have on surrounding sensitive receptors, as well as long term impacts that operations may have on these receptors.

To facilitate this, a preliminary Noise and Vibration Impact Assessment (NVIA) has been completed utilising the current layout plan (shown in [Appendix A – Master Plan of Designation Area](#)) and a number of assumptions and exclusions, agreed with the project engineering design team, that set out a basis of plant, equipment, assumed activities, and vehicle movement to be utilised to determine the likely impacts of the project during construction and operation.

The NVIA does not consider the detailed requirements for obtaining operational licences and Environmental Authorities (EAs) for performing Environmentally Relevant Activities (ERAs) at the ARRC. Additional studies to inform future EA applications will be completed, building upon the findings and calculations in this NVIA, once the ARRC precinct designs are detailed and advanced enough to perform more accurate noise and vibration calculations.

4.8.2 Existing Environment and Background Conditions

Attended and unattended noise monitoring was conducted to enable the establishment of an existing noise environment near the ARRC site and to establish construction and operational noise limits at noise-sensitive receptors.

Noise Sensitive Receptors

The ARRC is proposed to be located in the suburb of Stapylton, in the northern Gold Coast, to the east of the Pacific Motorway (M1). The surrounding land uses are predominantly industrial and farming, with two existing operational landfills to the west and east of the site. While the surrounding area is predominantly industrial and agricultural, there are several clusters of sensitive residential premises and individual farmhouses located around the site, including some within the industrial zones. Areas where multiple sensitive receptors were identified in close proximity have been grouped together into Noise Catchment Areas (NCAs), are shown in Figure 34, and are detailed in Table 71. These NCAs represent regions where receivers share similar land use and ambient noise conditions. Compliance with noise criteria at the identified receptor within an NCA suggests that receptors further away in the same NCA will also meet the noise requirements.

Table 71 Noise sensitive receptors identified for the purpose of the preliminary ARRC NVIA

Sensitive Receptor ID	Noise Catchment Area (NCA)	Height of receptor assessed	Address / Description	Distance from nearest ARRC site boundary (km)
Residential				
R1	-	GF 1.5 m L1 4.5 m	10 Alberton Road, Alberton	1.11
R2	-	GF 1.5 m L1 4.5 m	181 Quinns Hill Road East, Stapylton	0.89
R3	-	GF 1.5 m L1 4.5 m	281 Stapylton Jacobs Well Road, Stapylton	0.61
R4	-	GF 1.5 m L1 4.5 m	279 Stapylton Jacobs Well Road, Stapylton	0.53
R5	NCA2	GF 1.5 m L1 4.5 m	22 Quinns Hill Road West, Stapylton	0.29
R6	NCA2	GF 1.5 m	29 Quinns Hill Road West, Stapylton	0.25
R7	NCA2	GF 1.5 m	163 Stapylton Jacobs Well Road, Stapylton	0.38
R8	NCA2	GF 1.5 m L1 4.5 m	167 Stapylton Jacobs Well Road, Stapylton	0.34
R9	-	GF 1.5 m L1 4.5 m	146 Quinns Hill Road East, Stapylton	0.55
R10	-	GF 1.5 m L1 4.5 m	146 Quinns Hill Road East, Stapylton	0.43
R11	NCA1	GF 1.5 m	10 Yellowwood Road, Stapylton	0.11
R12	NCA1	GF 1.5 m	21 Hillside Drive, Stapylton	0.12
R13	-	GF 1.5 m L1 4.5 m	42 Cedar Drive, Stapylton	0.81
R14	NCA1	GF 1.5 m	197 Rossmanns Road, Stapylton	0.10

Sensitive Receptor ID	Noise Catchment Area (NCA)	Height of receptor assessed	Address / Description	Distance from nearest ARRC site boundary (km)
R15	NCA1	GF 1.5 m	233 Burnside Road, Stapyhton	0.10
R16	NCA1	GF 1.5 m L1 4.5 m	33 Kristy Court, Yatala	0.10
R17	NCA3	GF 1.5 m	42 Cedar Dr, Stapyhton	1.25
R18	NCA4	GF 1.5 m L1 4.5 m	47 Forest Avenue, Ormeau	0.78
R19	-	GF 1.5 m	233 Burnside Road, Stapyhton	0.37
R20	-	GF 1.5 m	222 Burnside Road, Stapyhton	0.50
R21	-	GF 1.5 m	231 Burnside Road, Stapyhton	0.36
R22	NCA4	GF 1.5 m	213 Rossmanns Road, Stapyhton	0.95
R23	NCA4	GF 1.5 m	219 Rossmanns Road, Stapyhton	1.06
R24	NCA4	GF 1.5 m L1 4.5 m	370 Burnside Road, Stapyhton	1.26
R25	-	GF 1.5 m L1 4.5 m	41 Woolshed Road, Stapyhton	0.80
Childcare Centre				
CC1	-	GF 1.5 m L1 4.5 m L2 7.5 m	196 Stapyhton Jacobs Well Road, Stapyhton / Little Scholars School of Early Learning, Stapyhton	0.12
Commercial				
C1	-	GF 1.5 m L1 4.5 m	287 Stapyhton Jacobs Well Road, Alberton / The Gem Hotel	0.65
C2	-	GF 1.5 m L1 4.5 m	281 Stapyhton Jacobs Well Road Stapyhton / Gem Bait & Tackle	0.60
C3A	NCA2	GF 1.5 m	29 Quinns Hill Road West, Stapyhton / A Direct Cremation	0.31

Sensitive Receptor ID	Noise Catchment Area (NCA)	Height of receptor assessed	Address / Description	Distance from nearest ARRC site boundary (km)
C3B	NCA2	GF 1.5 m L1 4.5 m L2 7.5 m	29 Quinns Hill Road West, Stapylton / Eco Memorial Park	0.38
C4	-	GF 1.5 m L1 4.5 m	Henry Hester Drive, Stapylton / BP Service Station and eatery	1.62
C5	-	GF 1.5 m L1 4.5 m	100 Stapylton Jacobs Well Road, Stapylton / Beenleigh Drive-in cinema	0.64

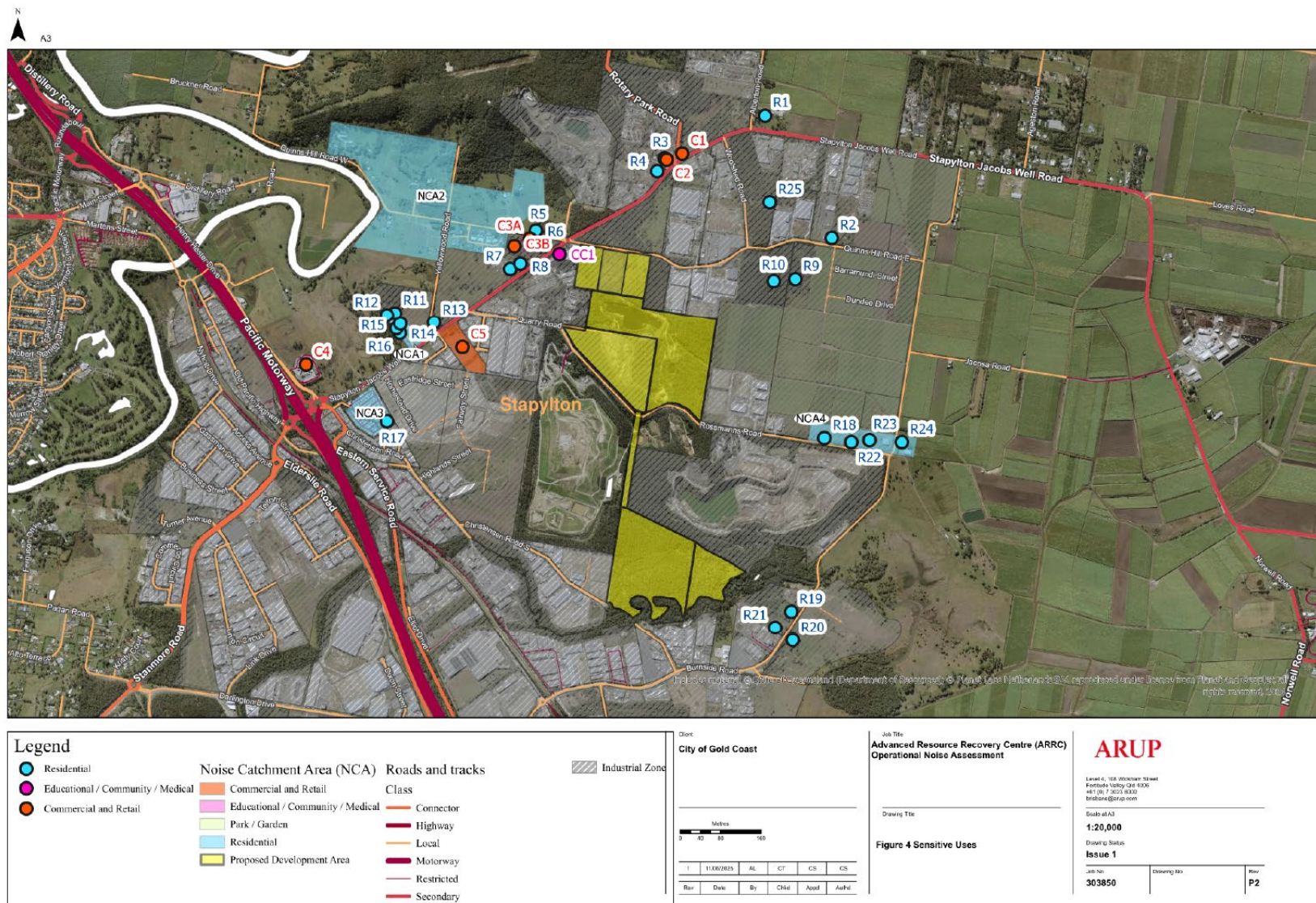


Figure 34 Identified sensitive receptors

Long-term Noise Monitoring

Long-term noise monitoring was conducted at locations shown in Figure 35 and Table 72 between Wednesday 23 and Thursday 31 October 2024. Noise measurements were carried out at these locations as they were determined to be representative of the ambient noise environment and applicable to numerous receptors. Monitoring was conducted in accordance with the DETSI Noise Measurement Manual (DES, 2020a) and EIS information guidelines (DES, 2020b) during June 2024 to understand the existing noise environment in the study area. Subjective review of the monitoring data at location M1 (i.e., during site visits and through spot-check listening to audio recordings from throughout the unattended monitoring period) identified a continuous extraneous noise source prevalent from Monday to Saturday. It is likely the extraneous noise source is due to temporary construction activities nearby and it is raising the background noise levels higher than the typical environmental conditions. Therefore, the background noise data measured on Sunday without the extraneous noise (i.e., the assessment background level, ABL) was used to establish the overall rating background noise level (RBL) as a conservative approach to minimise potential background noise level creep from the operation of the project facilities. Where cicadas were identified, processing was conducted to remove their noise contribution from the measurements. For all measurement locations this removal resulted in an adjustment of less than 2 dB(A).

Table 72 Long-term noise monitoring results summary

Location	Description ¹	Time Period ²	Rating background noise levels ³ , dBL _{A90, 1hr}
M1 – 42 Quinns Hill Road East, Stapylton	Logger located beside existing shed on edge of paved driveway. Area open with clear line of sight to Quinns Hill Road East. Noise monitoring location considered representative of sensitive uses within mixed residential/commercial zone directly north and east of the site.	Day	41
		Evening	42
		Night	40
M2 – 6 Ironbark Court, Stapylton	Logger located on front lawn beside the wire property fence. Noise monitoring location considered representative of residential receptors in NCA2 northwest of the project area west of Stapylton-Jacobs Well Road.	Day	41
		Evening	43
		Night	39

Location	Description ¹	Time Period ²	Rating background noise levels ³ , dBL _{A90, 1hr}
M3 – The Lodge, Stapylton	Located within the central amenity/BBQ/shared facilities area of the gated community (The Lodge). approx. 300 m from the Pacific Motorway and 160 m from Stapylton – Jacobs Well Road. Monitoring location is considered representative of residential receptors within the complex and of commercial and residential uses close to the southwest section of Stapylton – Jacobs Well Road.	Day	47
		Evening	45
		Night	42
M4 – 231 Burnside Road, Stapylton	Located near an internal unpaved road to the rear of the main access to rural property, approximately 40m from adjacent commercial/industrial use, and 100m from Burnside Road. Monitoring location considered representative of closest rural residential users within the area.	Day	43
		Evening	36
		Night	33

1 – Day: 07:00 to 18:00 Monday to Sunday; Evening: 18:00 to 22:00 Monday to Sunday; Night: 22:00 to 07:00 Monday to Sunday

2 – Microphone set up 1.5m above the ground in a free-field condition and fitted with a wind shield.

3 – The RBL values present as L_{A90, 1hr} have been derived based on the measured 15-minute intervals to aid with processing of adverse weather and extraneous noise events.

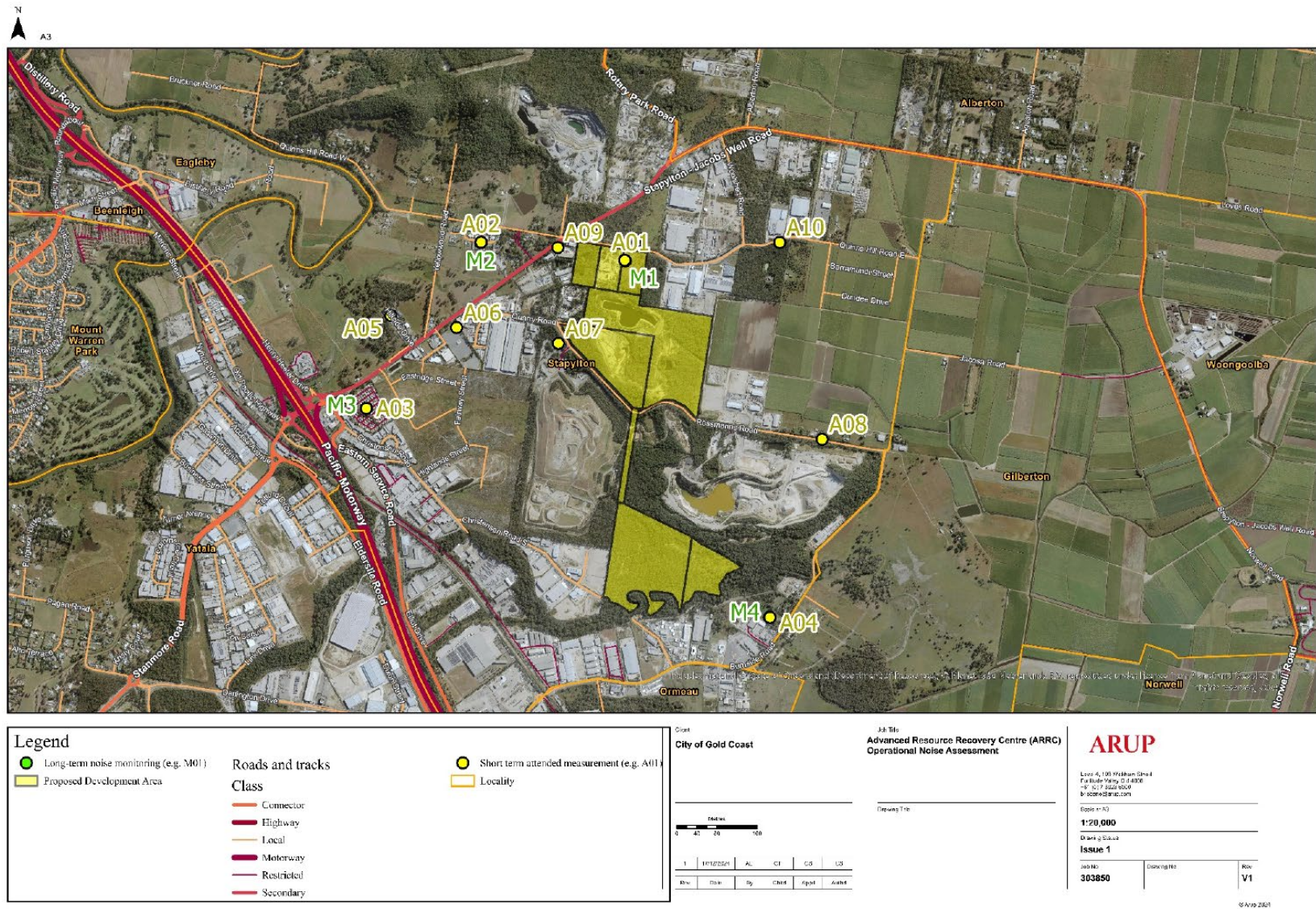


Figure 35 Long- and short-term noise monitoring locations

Short-Term Noise Monitoring Events

Short-term, attended noise monitoring was carried out at the locations A01 – A10 shown in Figure 35. The ambient noise environment was observed to typically be defined by traffic where monitoring was conducted near Stapylton-Jacobs Well Road and Rossmann's Road (i.e., A02, A3, A4, A7, A10, A8 and A9). Construction noise from numerous developments within the region were responsible for noise levels measured at A1 and A5 while local activity influenced noise levels at A6. Due to a road closure, activity in the absence of these sources was controlled by rustling trees and bird calls at A10.

Attended measurements were conducted during noise logger deployment except at A5 which was repeated upon logger retrieval. The rationale for this was due to the observation of reduced nearby excavator activity upon logger collection, however, comparison between measured levels on both occasions indicated that distant construction noise and traffic define background levels at this location, rather than nearby excavation activity within the commercial estate (because of its intermittent activity).

Location A10 was added to capture the noise level to the northeast of the site representative of a few existing residences (R2, R9, R10 and R25). Due to the road closure, ambient conditions were defined by local flora and fauna with minimal influence from commercial activity across the road and passing traffic.

4.8.3 Construction Noise and Vibration Management

The EP Act provides the overarching framework for managing environmental nuisance, including construction noise, in Queensland. Under this framework, the City sets specific limits on when audible construction work and deliveries can occur. These are restricted to between 6:30 am and 6:30 pm, Monday to Saturday, with no noisy work permitted on Sundays or public holidays unless an after-hours permit is granted by the City.

While there is no legislative requirement to prepare a noise and vibration assessment or management plan, the City will develop a Construction Noise and Vibration Management Plan and a Construction Traffic Management Plan for this project before works begin. These plans will be prepared once detailed information on construction activities, staging, and equipment is available, to help manage potential noise and vibration impacts.

4.8.4 Operational Noise and Vibration Assessment

Noise emissions from the operation of the project are regulated under the EP Act, the EP Reg and the Environmental Protection (Noise) Policy 2019 (EPP Noise). DETSI provides further guidance on noise assessment and management, ensuring that noise emissions are controlled to prevent environmental harm and nuisance. This section addresses airborne noise from the operation of the site, traffic noise from traffic directly related to the operation of the site, and ground vibration transmitted by operations.

Operational Noise Assessment Criteria

EPP Noise provides Acoustic Quality Objectives (AQOs) for sensitive receptors that provide a mechanism for mitigating the risk of harm from noise emitted by the ARRC's operational activities. To conduct an assessment of the ARRC against the AQOs, the site was assessed as a whole (i.e., noise emitted from the operation of all precincts, rather than assessing each precinct in isolation of one another). Given the design of the ARRC is at varying stages of development, assumptions were made using available Basis of Design documentation for the project specifically, and where not available, information from similar operational facilities locally (if available) or

within Australia if no local examples exist. This information was measured against the ambient noise measured as described in Section 4.8.2 with the inclusion of background creep, which the EPP Noise provides provisions for.

A review of the assumed operational noise sources indicated that some sources will produce steady-state noise while others may generate fluctuating noise. The findings of the assessment and criteria determined are presented in Table 73.

Table 73 Project noise criteria summary for normal operations – outdoor noise levels

Sensitive Receptor	ID ¹	Representative Logger Location	Applicable Location	Time of Day ³	Acoustic Quality Objectives (measured at receptor), dB(A)			Background Creep, dB(A)	
					L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}	(A) for noise that is continuous, predicted L _{A90,1hr} no more than existing L _{A90,1hr}	(b) for noise that varies over time, predicted L _{Aeq,1hr} no more than existing L _{A90,1hr} + 5 dBA
Residence	R2, R9, R10, R25	M1	Residence (for outdoors) ²	Daytime	50	55	65	41	46
				Evening	50	55	65	42	47
				Night	-	-	-	40	45
			At building façade	Daytime	42	47	52	41	46
				Evening	42	47	52	42	47
				Night	37	42	47	40	45
Residence	R1, R3 to R8, R11 to R16 (NCA1)	M2	Residence (for outdoors) ²	Daytime	50	55	65	41	46
				Evening	50	55	65	42	47
				Night	-	-	-	39	44
			At building façade	Daytime	42	47	52	41	46
				Evening	42	47	52	42	47
				Night	37	42	47	39	44
Residence		M3		Daytime	50	55	65	47	52

Sensitive Receptor	ID ¹	Representative Logger Location	Applicable Location	Time of Day ³	Acoustic Quality Objectives (measured at receptor), dB(A)			Background Creep, dB(A)	
					L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}	(A) for noise that is continuous, predicted L _{A90,1hr} no more than existing L _{A90,1hr}	(b) for noise that varies over time, predicted L _{Aeq,1hr} no more than existing L _{A90,1hr} + 5 dBA
	R17 (NCA3)		Residence (for outdoors) ²	Evening	50	55	65	45	50
				Night	-	-	-	42	47
			At building façade	Daytime	42	47	52	47	52
				Evening	42	47	52	45	50
				Night	37	42	47	42	47
Residence	R18 to R24 (NCA4)	M4	Residence (for outdoors) ²	Daytime	50	55	65	43	48
				Evening	50	55	65	36	41
				Night	-	-	-	33	38
			At building façade	Daytime	42	47	52	43	48
				Evening	42	47	52	36	41
				Night	37	42	47	33	38
Childcare Centre or Kindergarten	CC1	M2	At building façade	When open for business, other than when the children usually sleep (assumed daytime)	49	-	-	41	46

Sensitive Receptor	ID ¹	Representative Logger Location	Applicable Location	Time of Day ³	Acoustic Quality Objectives (measured at receptor), dB(A)			Background Creep, dB(A)	
					L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}	(A) for noise that is continuous, predicted L _{A90,1hr} no more than existing L _{A90,1hr}	(b) for noise that varies over time, predicted L _{Aeq,1hr} no more than existing L _{A90,1hr} + 5 dBA
Childcare Centre or Kindergarten	CC1	M2	At building façade	When the children usually sleep (assumed daytime)	44	-	-	41	46
School or Playground	CC1	M2	Outdoors within playground	When the children usually play (assumed daytime)	55	-	-	41	46
Commercial and Retail	C1, C2, C3a, C3b (NCA2)	M2	At building façade	When the activity is open for business (assumed daytime)	52	-	-	41	46
Commercial and Retail	C4	M3	At building façade	Daytime	52	-	-	47	52
				Evening	52	-	-	45	50
				Night	52	-	-	42	47
Commercial and Retail	C5	M2	AQOs apply at building facades and background creep applies in outdoors across drive-in cinema area	Daytime	52	-	-	41	46
				Evening	52	-	-	42	47
				Night	52	-	-	39	44

Notes:

1 – Compliance with noise criteria at the identified receptors within an NCA should suggest that receptors further away in the same NCA will also meet the noise requirements.

2 – Residences (for outdoors) is interpreted to apply at outdoor areas near to the residential dwelling (i.e., typical backyard, front yard, balconies).

3 – Time periods include from Monday to Sunday with daytime: 07:00 to 18:00, evening: 18:00 to 22:00, and nighttime: 22:00 to 07:00.

Emergencies, Upset Conditions, and Maintenance Operations

EPP Noise does not adequately accommodate maintenance, upset, or emergency conditions, such as during power failures or natural disasters, or where significant plant is taken offline for critical maintenance. As such, it is typical in Queensland to apply emergency planning criteria at +5dB above the standard operations noise planning criteria for each time period.

Operational Assessment Methodology

Noise emissions from the assumed operations of the ARRC as a whole have been assessed to the noise limits described in Table 73 using a 3-dimensional model in SoundPlan 9.1, following ISO 9613-2:2024 algorithm. There are multiple individual noise sources that make up the total overall noise emitted from the project. The individual sources were modelled based on their anticipated equivalent continuous sound power levels (L_{eq}) and assuming they are operating concurrently.

Operating hours for each precinct have been assessed using nighttime criteria as the operational hours for the ARRC have not yet been fully confirmed. By assessing activities against nighttime noise criteria, a conservative approach has been taken to ensure operational compliance during day and evening hours as well. It should be noted that more comprehensive modelling will be completed once each facility has been further developed and detailed design confirmed, where exact plant specifications will be used to inform noise generation during operations and assist in the development of a more accurate and less conservative assessment.

Prediction results outputted from the model as L_{eq} values are assessed against the L_{eq} AQO nighttime criteria from EPP Noise. To assess the risk of 'background creep' and to minimise it per EPP Noise requirements, a prediction of the background noise level emitted from the project is made to compare against the corresponding $L_{A90,1hr}$ background noise emission criteria. In practice, due to the differences in types of noise sources (i.e., different equipment, truck types/routes) and from the diversity of the individual operating intervals and locations, the overall noise levels emitted from the project to sensitive receptors is anticipated to have some variance with time. As such, the predicted noise levels (which are modelled as $L_{Aeq,1hr}$, effectively assuming a 'worst case' that all sources emit noise simultaneously and continuously) are expected to be slightly higher than the background noise ($L_{A90,1hr}$) emitted from the project. Based on this it is conservatively estimated that the background noise level ($L_{A90,1hr}$) emitted from the project will be about 3 dBA below the predicted equivalent continuous noise level $L_{Aeq,1hr}$. As such, the following conversion factor has been applied to the predicted L_{eq} noise levels to estimate the $L_{A90,1hr}$ values:

$$L_{A90,1hr} \approx L_{Aeq,1hr} - 3 \text{ dBA}$$

Operational Noise Predictions

Predicted sound pressure levels assessed against the AQOs and the background creep criteria targets are shown in Table 74 (AQO limits) and Table 75 (background creep). A low frequency screening assessment was carried out for the project operation (including noise emissions from all sites within the project) and no risk of requiring a low-frequency noise penalty to be applied was identified as part of this assessment.

Table 74 Predicted levels - assessment against the Nighttime LAeq AQO Limits (dBA)

Receiver ID	AQO limit (Nighttime)	ARRC operation predicted levels (all sites)	Comply with nighttime AQO?	Individual site contribution					
				Community Centre contribution	ARRC Innovation Park contribution	Hydrogen Refuel Facility contribution	Mono cell contribution	MRF contribution	Residual WtE contribution
C1	52	47	Yes	20	36	31	40	38	44
C2	52	48	Yes	20	37	32	41	39	44
C3A	52	49	Yes	25	41	29	46	31	43
C3B	52	49	Yes	27	41	32	43	34	46
C4	52	43	Yes	19	28	29	34	26	40
C5	52	42	Yes	15	32	25	30	21	37
CC1	44	37	Yes	10	30	27	28	23	31
R1	37	45	No, 8 dB exc	16	32	28	37	33	43
R2	37	49	No, 12 dB exc	17	31	28	38	33	48
R3	37	48	No, 11 dB exc	20	37	32	41	39	45
R4	37	49	No, 12 dB exc	21	39	33	42	41	45
R5	37	49	No, 12 dB exc	25	42	30	45	36	44
R6	37	48	No, 11 dB exc	20	41	28	45	31	41
R7	37	46	No, 9 dB exc	25	40	31	38	27	42
R8	37	48	No, 11 dB exc	26	42	30	40	31	43
R9	37	52	No, 15 dB exc	18	33	29	42	35	51
R10	37	54	No, 17 dB exc	18	34	29	43	37	53
R11	37	43	No, 6 dB exc	21	31	30	37	21	39
R12	37	42	No, 5 dB exc	21	30	30	35	23	39
R13	37	45	No, 8 dB exc	25	34	34	38	28	42

Receiver ID	AQO limit (Nighttime)	ARRC operation predicted levels (all sites)	Comply with nighttime AQO?	Individual site contribution					
				Community Centre contribution	ARRC Innovation Park contribution	Hydrogen Refuel Facility contribution	Mono cell contribution	MRF contribution	Residual WtE contribution
R14	37	43	No, 6 dB exc	23	31	32	37	27	38
R15	37	42	No, 5 dB exc	19	31	28	33	27	37
R16	37	45	No, 8 dB exc	23	32	33	37	26	42
R17	37	42	No, 5 dB exc	21	26	27	34	21	37
R18	37	50	No, 13 dB exc	20	26	30	35	21	48
R19	37	51	No, 14 dB exc	16	24	30	32	24	42
R20	37	49	No, 12 dB exc	14	23	28	31	23	42
R21	37	51	No, 14 dB exc	17	25	29	33	26	44
R22	37	45	No, 8 dB exc	11	22	24	28	25	43
R23	37	48	No, 11 dB exc	16	26	27	35	26	46
R24	37	47	No, 10 dB exc	16	27	27	35	27	45
R25	37	51	No, 14 dB exc	19	33	30	44	36	50

Table 75 Predicted levels - assessment against the LA90 nighttime background creep limits (dBA)

Receiver ID	LA90 background creep criteria (Nighttime)	ARRC operation predicted levels (all sites)	Comply with nighttime LA90 background creep criteria?	Individual site contribution					
				Community Centre contribution	ARRC Innovation Park contribution	Hydrogen Refuel Facility contribution	Mono cell contribution	MRF contribution	Residual WtE contribution
C1	41	44	No, 3 dB exc	17	33	28	37	35	41
C2	41	45	No, 4 dB exc	17	34	29	38	36	41
C3A	41	46	No, 5 dB exc	22	38	26	43	28	40
C3B	41	46	No, 5 dB exc	24	38	29	40	31	43
C4	42	40	Yes	16	25	26	31	23	37
C5	39	39	Yes	12	29	22	27	18	34
CC1	41	34	Yes	7	27	24	25	20	28
R1	39	42	No, 3 dB exc	13	29	25	34	30	40
R2	40	46	No, 6 dB exc	14	28	25	35	30	45
R3	39	45	No, 6 dB exc	17	34	29	38	36	42
R4	39	46	No, 7 dB exc	18	36	30	39	38	42
R5	39	46	No, 7 dB exc	22	39	27	42	33	41
R6	39	45	No, 6 dB exc	17	38	25	42	28	38
R7	39	43	No, 4 dB exc	22	37	28	35	24	39
R8	39	45	No, 6 dB exc	23	39	27	37	28	40
R9	40	49	No, 9 dB exc	15	30	26	39	32	48
R10	40	51	No, 11 dB exc	15	31	26	40	34	50
R11	39	40	No, 1 dB exc	18	28	27	34	18	36
R12	39	39	Yes	18	27	27	32	20	36
R13	39	42	No, 3 dB exc	22	31	31	35	25	39

Receiver ID	LA90 background creep criteria (Nighttime)	ARRC operation predicted levels (all sites)	Comply with nighttime LA90 background creep criteria?	Individual site contribution					
				Community Centre contribution	ARRC Innovation Park contribution	Hydrogen Refuel Facility contribution	Mono cell contribution	MRF contribution	Residual WtE contribution
R14	39	40	No, 1 dB exc	20	28	29	34	24	35
R15	39	39	Yes	16	28	25	30	24	34
R16	39	42	No, 3 dB exc	20	29	30	34	23	39
R17	42	39	Yes	18	23	24	31	18	34
R18	33	47	No, 14 dB exc	17	23	27	32	18	45
R19	33	48	No, 15 dB exc	13	21	27	29	21	39
R20	33	46	No, 13 dB exc	11	20	25	28	20	39
R21	33	48	No, 15 dB exc	14	22	26	30	23	41
R22	33	42	No, 9 dB exc	8	19	21	25	22	40
R23	33	45	No, 12 dB exc	13	23	24	32	23	43
R24	33	44	No, 11 dB exc	13	24	24	32	24	42
R25	40	48	No, 8 dB exc	16	30	27	41	33	47

Table 74 and Table 75 highlight the risk of potential significant exceedances of the AQO and background noise levels at several sensitive receptors, primarily at residential properties. However, these potential exceedances are influenced by several assumptions made during this preliminary assessment:

- **Assumed Source Locations and Operations:** Specific noise source locations, types, quantities, operations and sound power levels were estimated, as were the number of vehicles accessing various facility sites, and the sizes and locations of buildings within the sites. While these assumptions are considered representative of potential development scenarios, they are preliminary approximations at an early stage of the project layout design and may vary significantly as the technical design of each facility site is developed in the future.
- **Absence of Mitigation Measures:** No noise mitigation measures were implemented in this preliminary assessment.
- **Night-Time Operation Assumptions:** All sites were assumed to operate at night, necessitating a comparison against stricter night-time noise criteria; however, it is noted that many receptors have significant exceedances predicted during daytime hours as well. No potential reductions in operating hours, equipment operating speeds/loads, or truck traffic volumes within the sites during night-time were accounted for.

Despite the conservative nature of this assessment and the reliance on assumptions, the tables identify key sites contributing most to the predicted noise levels. Specifically, the highest noise contributions originate from the residual WtE facility and the mono cell. Major sources include truck movements at both the residual WtE facility and mono cell, the dozer operating in the mono cell, breakout sources from the residual WtE buildings, and residual WtE site equipment. Other significant contributors to the predicted noise levels is the ARRC Innovation Park with noise from trucks and fans, and the MRF primarily due to truck and forklift activities.

This information helps identify specific equipment or processes where targeted strategies and mitigation measures should be implemented to effectively address potential noise impacts. The key challenge lies with the trucks, as mitigating their noise levels is difficult. Noise from the buildings is expected to be relatively easy to mitigate, as are the fans and pumps by incorporating typical measures such as sound attenuators and equipment enclosures.

Operational Road Traffic Noise Assessment Methodology

Noise from traffic within the site is generally assessed under the EPP Noise. When vehicles transition to the public road network, any increase in noise levels resulting from the operation of a new development is typically evaluated in-line with the Transport and Main Roads (TMR) Code of Practice Volume 1 (CoPV1 – TMR, 2013). TMR CoPV1 provides requirements for assessing and managing the impact of road traffic noise and sets criteria for state-controlled roads in Queensland. The TMR CoPV1 also defines the requirements for assessment of State Road traffic noise impacts upon new noise sensitive developments that may be developed to protect amenity of the new development and for assessment of road traffic noise that may be generated by a new development (noise sensitive or not) on new roads and existing roads. Most of the sites within the Project are not considered noise-sensitive developments, with the potential exception of the Community Centre. However, increased traffic from the project operations may impact sensitive receptors along the nearby road network. To address this, the potential rise in traffic noise levels in the surrounding area due to the operation of the project

has been assessed. Note that the Community Centre (a potential noise-sensitive development) will be designed to minimise traffic noise intrusion (i.e. anticipated to likely to comply with Australian Standards).

A preliminary screening assessment can be conducted in general accordance with the CoPV1, referencing its guidance that increases in road traffic noise of up to 3 dBA over existing levels are considered insignificant, as they do not result in a perceptible change in loudness. If the screening assessment indicates that noise level increases are within this threshold, no further assessment is necessary. If the predicted increase exceeds 3 dBA, a detailed assessment must be undertaken to determine whether the increase aligns with the noise criteria specified in Table 3.2(a) of the CoPV1.

Operational Road Traffic Noise Assessment Predictions

The assessment considered two time periods: 16-hour traffic volumes and 1-hour traffic volumes. The 16-hour period traffic, 4:00 am to 8:00 pm, aligns with the anticipated operating hours of the project during which vehicles are expected to travel to the site. The 1-hour period, from 6:00 am to 7:00 am represents the peak hour when traffic generated by the project's operations is expected to be at its highest (preliminary estimate).

Assessment over a 16-hour period is generally suitable for roads with high traffic volumes, whereas a 1-hour period is more appropriate for evaluating low traffic noise. According to Section 4.3.1 of TMR CoPV1, low traffic flow conditions are defined as those where traffic volumes fall below approximately 300 vehicles per hour, 4,000 vehicles over an 18-hour period (6:00 am to 12:00 am), or 4,500 vehicles per day (24 hours).

The initial assessment includes a calculation of the percentage increase in noise levels caused by the additional traffic on the road network. Figure 36 provides details about the assessed segments, Table 76 and Table 77 summarise the results. The assessment is for year 2042 (i.e., 10 years after targeted opening date).

Table 76 Number of vehicles on public road network and predicted increase in noise levels as a direct result of the ARRC - 16-hour period from 4:00am to 8:00pm

Road	Section	Existing without ARRC			Existing + ARRC			Predicted noise level increase, [dB]		
		Number of light vehicles	Number of heavy vehicles	Total	Number of light vehicles	Number of heavy vehicles	Total	Light vehicles	Heavy vehicles	Total
Stapylton Jacobs Well Road	T1	16,878	6,408	23,286	17,401	7,077	24,478	0.1	0.4	0.2
Quarry Road	T2.1	3,121	3,045	6,166	3,598	3,714	7,312	0.6	0.9	0.7
Rossmans Road	T2.2	1,813	2,488	4,301	1,906	3,129	5,035	0.2	1.0	0.7
Rossmans Road	T2.3	1,291	2,005	3,296	1,728	2,604	4,332	1.3	1.1	1.2
Rossmans Road	T2.4	1,251	1,942	3,193	1,728	1,942	3,670	1.4	0.0	0.6
Rossmans Road	T2.5	1,251	1,942	3,193	1,251	1,942	3,193	0.0	0.0	0.0
Stapylton Jacobs Well Road	T3	15,110	4,448	19,558	15,156	4,462	19,618	0.0	0.0	0.0
Quinns Hill Road East	T4	2,748	455	3,203	2,801	469	3,270	0.1	0.1	0.1
Quinns Hill Road East:	T4.1	2,748	455	3,203	2,801	469	3,270	0.1	0.1	0.1

Road	Section	Existing without ARRC			Existing + ARRC			Predicted noise level increase, [dB]		
		Number of light vehicles	Number of heavy vehicles	Total	Number of light vehicles	Number of heavy vehicles	Total	Light vehicles	Heavy vehicles	Total
Quinns Hill Road East	T4.2	2,748	455	3,203	2,801	469	3,270	0.1	0.1	0.1
Stapylton Jacobs Well Road	T5	11,931	3,790	15,721	11,931	3,790	15,721	0.0	0.0	0.0
Christensen Road / Christensen Road South	T6	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Burnside Road	T7	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Christensen Road South	T7.1	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Burnside Road	T7.2	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P

Note: N/P not provided

Table 77 Number of vehicles travelling on the public road network and predicted increase in noise levels as a direct result of the ARRC - 1-hour peak period from 6:00 till 7:00am

Road	Segment	Existing without ARRC			Existing + ARRC			Predicted noise level increase, [dB]		
		Number of light vehicles	Number of heavy vehicles	Total	Number of light vehicles	Number of heavy vehicles	Total	Light vehicles	Heavy vehicles	Total
Stapylton Jacobs Well Road	T1	1,224	448	1,672	1,396	500	1,896	0.6	0.5	0.6
Quarry Road	T2.1	199	142	341	360	194	554	2.6	1.4	2.1
Rossmans Road	T2.2	126	81	207	136	133	269	0.3	2.2	1.1
Rossmans Road	T2.3	123	86	209	241	128	369	2.9	1.7	2.5
Rossmans Road	T2.4	81	74	155	242	74	316	4.8	0.0	3.1
Rossmans Road	T2.5	81	74	155	81	74	155	0.0	0.0	0.0
Stapylton Jacobs Well Road	T3	1,049	335	1,384	1,058	349	1,407	0.0	0.2	0.1
Quinns Hill Road East	T4	251	39	290	269	53	322	0.3	1.3	0.5
Quinns Hill Road East:	T4.1	251	39	290	269	53	322	0.3	1.3	0.5

Road	Segment	Existing without ARRC			Existing + ARRC			Predicted noise level increase, [dB]		
		Number of light vehicles	Number of heavy vehicles	Total	Number of light vehicles	Number of heavy vehicles	Total	Light vehicles	Heavy vehicles	Total
Quinns Hill Road East	T4.2	251	39	290	269	53	322	0.3	1.3	0.5
Stapylton Jacobs Well Road	T5	794	293	1,087	794	293	1,087	0.0	0.0	0.0
Christensen Road / Christensen Road South	T6	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Burnside Road	T7	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Christensen Road South	T7.1	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Burnside Road	T7.2	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P

Note: N/P = data not provided or available

The findings of both assessments indicate that the increase in road noise from the project operations is expected to be insignificant, except potentially along road segment T2.4. However, as there are no sensitive receptors near T2.4, the impact at this location is not considered significant. Based on this review and the current traffic flow predictions, traffic noise generated by the Project operations on public roads is expected to have negligible effect on existing road traffic noise levels. Consequently, operational road traffic noise has not been further assessed in this report.

Operational Vibration Impact Assessment

Potential for vibration impacts from the operation of the project on nearby off-site sensitive receptors are expected to be minimal/negligible. This is considered due to the types of operations / activities and building plant equipment anticipated (i.e. not considered a high risk of generating high vibration levels) and due to the significant distances to the nearest sensitive receptors (i.e., > 100m). Typical vibration isolation measures will be incorporated into the design of building plant equipment where necessary to reduce vibration transmission through the ground and building structures. In general, this will be motivated more by a desire to reduce risk of vibration affecting human comfort or structures within the project facilities rather than a need to reduce it at external receptor locations.

4.8.5 Mitigation, Management, and Controls

Numerous mitigation, management, and control measures and strategies will be implemented during construction and operation of each precinct within the ARRC. Where appropriate, mitigation measures will be integrated into the design of each facility, building, and the selection of plant as guided by this preliminary noise and vibration assessment. Examples of some of the strategies and measures that will be included and considered are provided in Table 78.

Table 78 Potential noise and vibration mitigation strategies

Aspect	Potential strategies or mitigation measures
Hours of operation	<ul style="list-style-type: none"> • Limit operational hours to EPP Noise daytime period; limit evening operations to activities that comply with EPP Noise evening criteria where not dictated by an Environmental Authority. • Limit number of trucks accessing sites outside of EPP Noise daytime hours. • Establish management procedures to minimise noise leakage from enclosed spaces.
Equipment and machinery	Plant selection based on noise minimisation and installation of noise attenuation devices for plant and machinery.

Aspect	Potential strategies or mitigation measures
Site layout/design	<ul style="list-style-type: none"> • Locate noisy operations or equipment away from sensitive receptors. • Use natural barriers like hills or man-made barriers like walls and berms to shield noise. • Design buildings and site layout to block or absorb noise (e.g., place offices or storage between sources and receptors). • Optimise access routes to limit truck movements near sensitive areas. • Review noise sources and mitigation measures during the detailed design phase. • Optimise design for noise control and efficiency. • Implement typical noise attenuations measures to mechanical equipment and buildings (e.g., attenuators, absorptive internal lining to ductwork, acoustic louvres).
Barriers and absorption	<ul style="list-style-type: none"> • Install acoustic barriers, noise walls, or berms around noisy areas where possible. • Utilise sound absorbing materials.
Vibration isolation	<ul style="list-style-type: none"> • Incorporate vibration isolation measures for equipment and machinery to reduce vibration transmission through the ground and building structures.

4.8.6 Summary and Conclusions

This preliminary Noise and Vibration Impact Assessment has been completed for the ARRC to inform the project of potential impacts to sensitive receptors from noise and vibration, and to assess the early ability of the project to comply with relevant Australian and State standards and requirements.

Findings of assessments completed for both construction and operational noise and operational vibration concluded that:

- A Construction Noise and Vibration Management Plan should be sufficient to manage and mitigate noise generated by construction activities, and a Construction Traffic Management Plan will enable construction activities to have minimised impacts to sensitive receptors from construction traffic noise.
- Without mitigation, the residual WtE facility and the mono cells are likely to be the primary contributors to operational noise from the ARRC. Similarly, MRF are also likely to contribute noise emissions from the ARRC that have the potential to impact sensitive receptors if not properly mitigated.
- Mitigation measures to attenuate and manage noise emissions from the ARRC operations will be incorporated into the design of each facility as it progresses and are expected to sufficiently enable the

ARRC as a whole to comply with EPP Noise and any Environmental Authority noise conditions that may apply to each precinct.

- Traffic noise caused as a direct result of ARRC operations is predicted to not cause a significant increase to existing traffic noises.
- Vibration from the operation of ARRC precinct areas is not expected to impact nearby off-site sensitive receptors, and with appropriate engineering controls it expected that impacts will be negligible.

4.9 Climate Change and Greenhouse Gases

4.9.1 Introduction, Scope, and Purpose

The ARRC project, while being beneficial in the reduction of greenhouse gas (GHG) emissions from landfill, will contribute some GHG emissions. In order to ensure due diligence is performed for the benefit of the community and to ensure the City's environmental and social licence, the City engaged Arup's Climate and Carbon Accounting experts to perform a GHG assessment for the project. The scope of the assessment includes:

- Lifecycle Assessment (LCA) – undertaken in accordance with ARENA Lifecycle Assessment Guidelines (LCA of Bioenergy Products and Projects), including selection of a reference system to compare against, defining the system boundary and environmental benefits of each facility in the ARRC. The LCA includes the calculation of GHG emissions, fossil energy use, and fossil resource depletion.
- GHG assessment – in addition to the LCA, a second GHG assessment was undertaken to compare the emissions against a baseline, which involved comparing the GHG emissions from each facility to the avoided grid emissions.

The two assessments were completed for the ARRC, considering the impact of each facility within the entire precinct area.

4.9.2 Lifecycle Assessment Requirements

The LCA has been completed in accordance with ARENA requirements for assessing a bioenergy project, compared to an appropriate reference system, and provide insights on the environmental impact of the ARRC from the perspective of carbon emissions, as well as the benefits of the project.

Reference System and Emission Factors

Two reference systems have been utilised to satisfy both the ARENA LCA Guidelines for reference fuels and the City's Net Zero goals in order to assess the ARRC's GHG impact.

The ARENA LCA Guidelines requires the assessment of the benefits of new renewable energy projects that are intended to replace fossil fuels in supplying the electricity grid with baseload power. The ARRC's residual WtE facility is intended to enable the supply of baseload power to the precinct to be entirely replaced by renewable (waste) generated power and to supply excess to the power grid, and as such falls within the category of a new renewable project. The reference system for the ARENA assessment was determined to be against conventional coal electricity. The emission factor assumed for this reference system is 90.24kg CO₂-e/GJ, based on the Australian National Greenhouse Accounts (NGA) factors (2023) from DCCEEW.

The alternative reference system, in the context of the City's Net Zero goals, was selected as the Queensland electricity grid supply, which represents a realistic alternative to the electricity supplied to the ARRC and City's facilities in the absence of the ARRC residual WtE facility. The emission factor of this reference system is 0.27 of CO₂-e per kWh with emissions projections in line with DCCEEW's baseline scenario, projected to net zero by 2050 in accordance with the Queensland Government's legislated net zero by 2050 target.

System Boundary

The ARRC system boundary includes all facilities located within the ARRC precinct (and as described in Section 3.1 as well as two facilities that are not to be included in the geographical boundary of the precinct – i.e., the organics and construction/demolition (C&D) processing facilities. The ARENA Guidelines enable a cut-off criterion based on mass and energy flows to be used to exclude minor flows for the system boundary. The cut-off for individual flows is one per cent and the cumulative contribution of excluded processes should not exceed five per cent.

Such exclusions include transport emissions relative to the baseline, due to their complexity, the limited available information for this study, and their relative immateriality. These include:

- Most City-derived C&D waste is currently taken to Reedy Creek Landfill, and the new processing facility will likely be co-located or located nearby, with negligible changes to transport emissions.
- There will be some reduction in transport emissions related to City-derived organics as currently approximately 50 per cent of organic waste is transported out of the Gold Coast; while with the new ARRC organics facility, all organic waste will remain within the Gold Coast.
- Other waste streams are currently transported to Stapylton Landfill, located adjacent to the proposed ARRC precinct, so transport changes will be negligible.

The system boundary for the ARRC is shown in Figure 37.

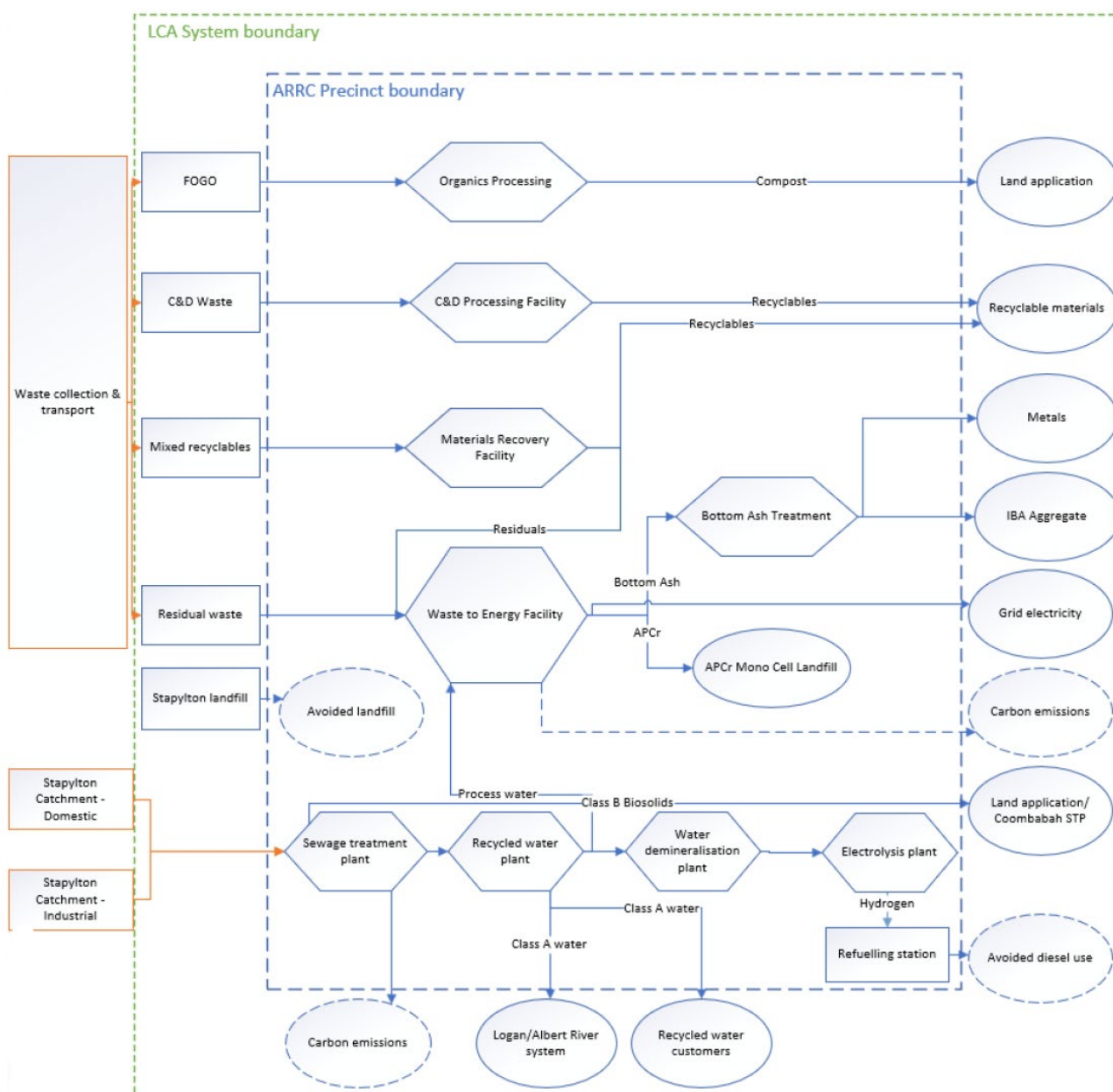


Figure 37 ARRC System boundary for GHG LCA

Environmental Impact Categories

The ARENA LCA guidelines require different categories of environmental impacts to be evaluated in the LCA study. The relevant categories are presented in

Table 79 Relevant environmental impact categories with reference fuels and functional units for different bioenergy systems from the ARENA LCA Guidelines

Indicator	Description	Characterisation Model
Climate change, GWP100	Measured in kg CO ₂ equivalents (kg CO ₂ -e)	IPCC 5 th Assessment Report model based on 100-year timeframe

Indicator	Description	Characterisation Model
Fossil fuels, abiotic depletion	Measured in kg oil equivalent	All fossil energy carriers based on relative scarcity
Eutrophication	Measured in phosphate equivalent. This indicator represents the growth of algae in freshwater and marine systems which can significantly affect the environmental quality due to oxygen depletion	Eutrophication potentials based on Heijungs et al. (1992), which assumes both N- and P-species contribute
Particulate matter	Measured in particulate matter less than 2.5 microns	Currently Humberts et al. (2011), until the recommended factors from Pelton Workshop (January 2016) are published by UNEP/SETAC.
Land use	Measured as kg soil organic matter (SOM) (kg C/m ² /a). Note that biodiversity impacts are not covered by the dataset.	ILCD with potential updated data based on LANDCARE funded project.
Consumptive water use	Measured as L H ₂ O equivalent global average water scarcity. Quantity of water extracted directly from the environment, thereby competing with environmental and other human requirements for water.	Method of Ridoutt and Pfister (2010) with water stress indices of Pfister et al. (2009).

Temporal Aspects

The ARENA LCA Guidelines requires the LCA to be based on the economic timeframe for the proposed plant and the associated equipment. In the case of the ARRC, the facilities are proposed to be fully functional by 2032, with a lifecycle of equipment of typically 20 to 30 years assumed. The Guidelines stipulate that the LCA should be undertaken without the effects of time, such as changes outside of the project's control (e.g., technology improvements, electricity grid changes, climatic changes, etc.). The Guidelines further state that the timing of emissions and removals shall be documented in an inventory and that the effects of time may be documented and reported separately. As such, this assessment considers separate documentation of the impact of grid decarbonisation on the GHG emissions of the project.

To provide a more comprehensive understanding of the ARRC's impact, this study included future emissions projections through the lifespan of the project, which assists with the understanding of ARRC's contribution and the impact to the City's broader net zero targets.

Multifunctionality and Allocation

The LCA Guidelines require the multifunctionality of the ARRC to be assessed based on the processes that create more than one useful product. In the case of the ARRC, which is comprised of multiple facilities, the allocation of impacts of a multifunctional system should be apportioned to different products where possible. These are described for the ARRC below.

Multifunctionality – Useful Product Outputs

The primary product of the ARRC is the power produced by the residual WtE facility, with current estimations (at the time of the assessment) projecting that the facility will produce approximately 69MW of power, with a normal operating load of 12 MW and a net average power production of 57MW. It has been calculated that this power output is sufficient to power the ARRC precinct (including the MRF), with excess power available to be exported to the grid, providing the benefit of a source of baseload power that is lower carbon than conventional coal.

The ARRC will also produce other useful outputs, such as recovered recyclable materials, including reusable aggregates from the incinerator bottom ash (IBA). These have environmental benefits as they reduce the volume of virgin material being extracted from the earth and processed with carbon-intensive processes. Other useful outputs from the ARRC include:

- Power generation from the residual WtE facility
- Recyclables from the MRF and C&D facilities
- Compost for land application from the Organics processing facility
- Recovered metals from the IBA treatment process
- IBAA for construction aggregates from the IBA
- Green hydrogen, produced via electrolysis from recycled water

Green hydrogen is proposed to also be used to fuel the City's heavy vehicle fleet, including kerbside waste collection vehicles, which in turn also displaces the use of diesel fuel and reduces emissions. Table 80 provides a detailed list of the ARRC's major facilities, their products, and the potential benefits.

Table 80 Product outputs and benefits from the ARRC facilities

Facility	Product	Description	Benefit
Residual WtE facility	Power generation	Power generated by the incineration of residual, non-recyclable waste	<p>Providing baseload power production, displacing coal-fired power generation.</p> <p>Diversion of waste from landfill to improve material recovery, recycling and reuse, and reduce landfill gas production/emission.</p>
	Recovered metals	Metals recovered from the IBA treatment process	<p>Recovered metals can be recycled and reduce the need for virgin materials to be extracted and processed.</p> <p>Diversion from landfill to improve material recovery.</p>
	Construction aggregates	Construction aggregates converted from IBA	<p>IBAA can be used in construction, reducing the need for virgin materials to be extracted and processed.</p> <p>Diversion from landfill to improve material recovery and reduce landfill gas production/emissions.</p>
Hydrogen Refuelling Station / Electrolysis Plant	Renewable hydrogen	Hydrogen produced from renewable source	Hydrogen is a potential fuel substitute for heavy vehicles, including waste collection vehicles. Reduced fossil fuel consumption.
Organics Processing Facility	Compost	Compost produced from food organics and green organics (FOGO) waste	<p>Compost for land application, potentially reducing the need for carbon-intensive synthetic fertiliser use.</p> <p>Diversion from landfill to improve material recovery and reduce landfill gas production/emissions.</p>
MRF	Recyclable materials	Recovered recyclables	<p>Opportunity for recovered materials to be recycled and reduce the need for virgin materials to be extracted and processed.</p> <p>Diversion from landfill to improve material recovery and reduce landfill gas production/emissions.</p>
C&D Waste Processing Facility	Recyclable materials	Recovered recyclables	Opportunity for recovered materials to be recycled and reduce the need for virgin

Facility	Product	Description	Benefit
			materials to be extracted and processed. Diversion from landfill to improve material recovery.

Allocation of Benefits and Impacts from ARRC

In accordance with the LCA Guideline, the ARRC facilities have been divided into separate studies to assess their individual impacts, while also summarising the overall impact and benefits of the ARRC.

Due to their material impact and information availability, the following facilities have been prioritised for the assessment:

- Residual WtE facility
- Organics processing facility
- Hydrogen refuelling station

The following facilities have been discussed with a high-level qualitative approach:

- MRF (although energy demand for this facility has been factored into the residual WtE facility energy balance)
- Administrative building and Community Education Centre
- C&D waste processing facility
- Innovation Park

4.9.3 Methodology

Overview of Approach

Once information on each facility, including material and energy input and outputs, was reviewed, the facilities were prioritised and assessed separately. Following this, the main steps are outlined below:

- Existing operations were reviewed to determine how waste (solid and liquid) is currently managed and establish the baseline.
- Concept design reports for planned facilities were reviewed to understand energy and material flows.
- Emissions factors were reviewed across publicly and non-public datasets to identify the most suitable factors (including NGER guidelines and AusLCI datasets).
- Energy and material use models were developed using excel-based spreadsheets, with forward projections throughout the lifespan of the projects. This included the modelling of alternative scenarios of accepting waste from other local governments.

- The ARRC's GHG footprint was compared to the reference system to determine the Precinct overall impact.

The inventory of inputs and outputs were determined using the system boundary shown in Figure 37. Emissions factors used for black coal electricity generation in Queensland were sourced from the AUSLCI database, with a value of 0.2642 kg CO₂-e per MJ (equivalent to 0.951 tonnes CO₂-e/MWh) used. A data quality assessment was also completed, identifying the available sources of data for the assessment, its reliability, completeness, and correlation where applicable. A full list of assumptions used for the assessment have been documented in the full report, which is available on request.

4.9.4 Lifecycle Assessment Results

Functional Unit Results for the Residual WtE Facility

The residual WtE facility will include feedstocks of mixed biogenic and fossil origin. Biogenic carbon is that which originates from biomass, while fossil carbon originates from geological fossil fuel reserves. As organic wastes are processed separately from the residual WtE facility, there is a relatively high fossil fuel energy use for the residual WtE facility. Composting FOGO is a preferred waste management and is a requirement of the Queensland EfW Policy for higher order resource recovery and management, offering substantial environmental benefits.

When compared to a black coal reference system, the fossil energy use for the residual WtE facility has a 94 per cent improvement. Under the 75 per cent landfill gas capture scenario, the GHG emissions of the residual WtE facility has an 85 per cent improvement over the reference system at the time it comes online in 2032. For the 50% landfill gas capture scenario, the facility has a 132 per cent improvement over the reference system.

4.9.5 GHG Assessment Results

The emissions contribution of all facilities in the ARRC is summarised in Table 81. The main contributor to the emissions reduction for the ARRC is the Organics Processing Facility. In 2032, the residual WtE facility is also contributing to emissions reduction. By 2050, the Residual WtE facility is producing more emissions than it offsets as the grid decarbonises, if the Queensland electricity grid is decarbonised according to the Queensland Net Zero targets and assuming that carbon capture is not implemented. It should be noted that the ARRC residual WtE facility is being designed and planned with future carbon capture capability in mind; however, as of the current date there are no proven, scalable carbon capture technologies available for Residual WtE facilities.

Table 81 Summary of results of GHG assessment for each major ARRC facility

Facility emissions reduction (tonnes CO ₂ -e per year)	2032	2050
Organics processing facility	-74,000	-98,000
Residual WtE facility (base case -75% landfill gas capture)	-71,000	100,000
Hydrogen Refuelling Station	-6,300	-6,300
Total emissions	-150,000	-1,000

Results by Facility

Residual WtE Facility

The residual WtE facility has been sized to process 660,000tpa and will receive residual waste feedstock generated predominantly from residents and businesses and comprise a combination of municipal solid waste (MSW), commercial and industrial waste (C&I), bulky waste from City waste recycling centres (WRCs) and other minor streams. At commissioning of the facility in 2032, approximately half of the feedstock is expected to come from third-party sources to meet the processing capacity. The ratio of the City to third party is expected to change over the 30-year lifespan as more City feedstock becomes available with population growth. Two scenarios have been considered:

- **Scenario 1:** Base Case City feedstock streams plus any additional feedstock required to meet total capacity is third-party residual C&I.
- **Scenario 2:** Additional feedstock is MSW supplied by Logan City Council (LCC) and Redlands City Council (RCC). Any feedstock still required after City, LCC and RCC residual waste streams are exhausted will comprise third-party residual C&I.

Key assumptions have been detailed in the full assessment report, which can be provided on request. Figure 38 shows the key inputs and outputs to the residual WtE facility.

Emissions factors for Scope 1 emissions have been calculated based on first principles in accordance with the methods provided by DCCEEW in the Australian NGA Factors (August 2023) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The NGA technical guidelines method for waste incineration was used to estimate the combustion emission factors (EF) for each of the feedstock streams proposed for the Residual WtE facility. Where data is available for feedstock composition and characteristics, it is preferred to use actual data over factors provided in the NGA and IPCC guidelines. For each feedstock the portion of each waste type (composition) is taken into consideration to determine the combustion EF. The moisture content of each waste type from characterisation data has also been considered to determine feedstock on an as-received wet basis as would enter the Residual WtE facility. Emissions factors for combustion of waste are very subjective to the type of waste streams that they comprise including the quantities of organic and inert materials, and the origin of the carbon associated with these materials whether it is of biogenic or fossil origin.

The suitability of these combustion emission factors has been compared against the NGA and IPCC default EF.

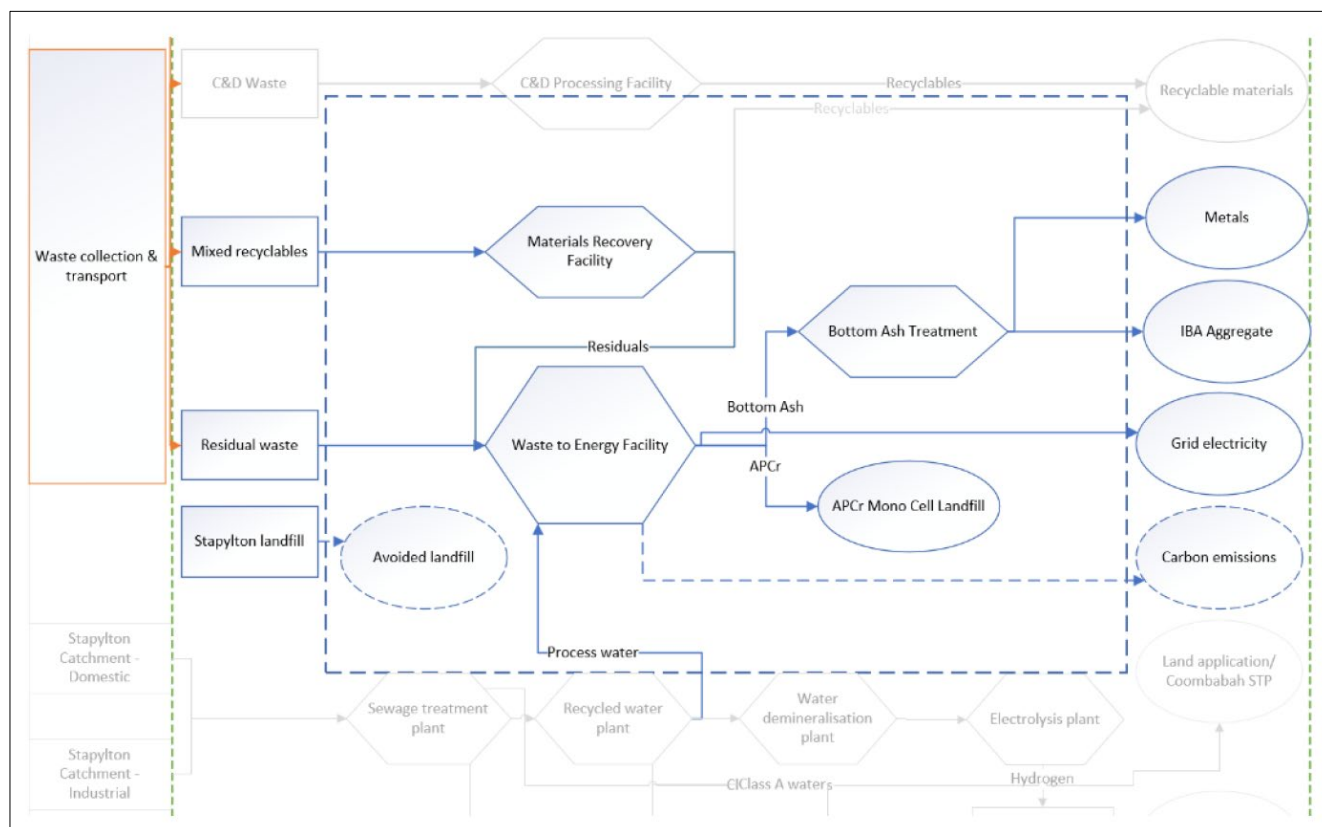


Figure 38 Block diagram showing main inputs and outputs from the residual WtE facility

The avoided emissions for waste materials not sent to landfill is captured as a landfill emissions abatement. The NGA refers to the NGER (Measurement) Determination 2008 which utilises a simple formula which estimates lifetime emissions from waste degradation in a landfill. Landfill gas emissions in reality occur over a period of decades. Landfill emission factors can be heavily influenced by organic material in the composition of each feedstock. As organic material (FOGO) is being recovered from the MSW feedstock, the overall avoided landfill emissions are lower than the standard MSW landfill emission factor of 1.6 tCO₂-e/tonne of waste provided in the NGA Factors guideline. C&I comprises 39% food organics contributing to higher emissions for landfilling than is provided in the NGA of 1.3 tCO₂-e/tonne of waste. No proposed organics separation has been assumed for C&I, however, there is a possibility in the future that recovery of food organics out of the commercial stream may be introduced.

The electricity used to power the residual WtE facility is assumed to be generated by the facility itself, with any additional electricity utilised firstly for the other facilities at the ARRC precinct and the remainder exported to the grid. An emissions abatement for the electricity not required from the grid as it is supplied by the Residual WtE facility has been considered as part of the assessment of overall Residual WtE emissions and to determine Scope 2 emissions. Current grid emission factors for Queensland assume a Grid EF of 0.73 tCO₂-e/MWh of electricity consumed for 2023. The carbon intensity of the grid is expected to reduce over time as Australia looks to achieve net zero by 2050, which will result in a net zero grid carbon intensity within the same timeframe. Future forecasting of the Residual WtE facility assume that at the time of commencement the grid carbon intensity is expected to be 0.27 tCO₂-e/MWh and further reducing to 0 by 2050. The impact of a lower grid

carbon intensity reduces the emission abatement opportunities for the residual WtE facility over time, as offset grid emissions diminish over time.

Indirect emissions (Scope 3) including for transport of feedstock to the Residual WtE facility and export of any by-products has been excluded from this GHG assessment as they are considered negligible in comparison to the emissions produced by the residual WtE facility.

Table 82 summarises the results of the assessment for the residual WtE facility.

Table 82 Summary of results of GHG assessment for residual WtE facility

Facility emissions reduction (tonnes CO ₂ -e per year)	2032	2050
Base case – Residual WtE Scenario 1a (75% landfill gas capture)	-70,603	101,920
Residual WtE Scenario 1b (50% landfill gas capture)	-329,447	-153,191
Residual WtE Scenario 2a (75% landfill gas capture)	-22,397	154,908
Residual WtE Scenario 2b (50% landfill gas capture)	-273,213	-91,380

The base case results (Scenario 1a) which assume a mix of City, and third-party C&I feedstocks has a GHG abatement of -70,603 tCO₂-e per year in 2032 and by 2050 is emitting 101,920 tCO₂-e per year based on a landfill capture rate of 75%. As the grid aims to reach its decarbonisation targets by 2050, there are no avoided grid emissions in 2050. Under Scenario 1b which assumes a lower landfill gas capture rate there are emissions reductions across the lifespan of the Residual WtE facility. It is expected that as the landfill industry continues to progress the landfill capture rate will continue to improve towards the base case scenario rather than the capture rate presented in Scenario 1b. Scenario 2 (a and b) show less emissions savings as a result of using more MSW waste from Redlands and Logan City Councils which generate higher combustion emissions from MSW and lower avoided landfill emissions.

Alternative Reference System

Queensland Electricity Grid: The Queensland electricity grid was used as the base case reference system, to estimate the effect of using Residual WtE electricity relative to using electricity from the grid. As the Queensland grid contains a mix of renewables and fossil fuel sources, the overall grid carbon intensity is lower than black coal-fired electricity. The Queensland grid carbon intensity is projected to decline in the coming decades as more renewable sources are added to the electricity generation mix.

There is uncertainty in the future Queensland grid carbon intensity, as it depends on the rate of roll out of renewable projects across Queensland. This GHG assessment used a publicly available projection from DCCEEW for the Queensland electricity grid in 2032. For 2050, the grid carbon intensity was assumed to be zero, assuming that Queensland meets its legislated Net Zero Target by 2050. A sensitivity assessment was run for a scenario where the Queensland electricity grid does not reach net zero by 2050. The assessment was

completed using a grid carbon intensity of 0.18 kgCO₂-e per kWh, which corresponds to projected 2035 values, with approximately 80 per cent renewable generation in the total generation mix for Queensland. With the extra emissions offset from the grid, the residual WtE plant has net negative emissions under this scenario. Note, this scenario does not correspond to any official government projections and has been run to determine the sensitivity of results to this assumption.

Black Coal Reference System: The ARENA LCA Guidelines propose using reference fuels to evaluate new baseload electricity generation, aiming to highlight the benefits of renewable energy projects replacing fossil fuels. In accordance with these guidelines, the ARRC project was compared against conventional coal-fired electricity. The estimated GHG emissions from the Residual WtE facility electricity were estimated to be an 85 per cent improvement over the black coal reference system.

Organics Processing Facility

Currently, the planned technology for the organics processing facility is an aerated (in-vessel composting) facility, which is a suitable option for processing FOGO waste. For the purpose of this assessment, it was assumed that 40 per cent would be food waste and 60 per cent green organics. EF from the Australian NGA Factors were utilised for the assessment. Table 83 summarises the results of the assessment.

Table 83 Summary of results of GHG assessment for organics processing

Facility emissions reduction (tonnes CO ₂ -e per year)	2032	2050
FOGO with organics processing	8,399	10,468
FOGO landfill emissions reduction	-82,168	-108,095
Total emissions reduction (tCO₂-e per year)	-73,768	-97,627

While aerobic organics processing still produced some emissions, the avoidance and reduction in emissions from landfill diversion of FOGO is significant.

Hydrogen Refuelling Facility

A Hydrogen refuelling facility producing renewable hydrogen is planned for the City but may not be located within the ARRC precinct; however, for the purpose of this assessment, the refuelling station is assumed to be located in the ARRC precinct. It is assumed that the plant will be powered by renewable power generated by the residual WtE facility. Current plans for hydrogen end use are to fuel the City's waste collection trucks and/or heavy vehicle fleet. The Hydrogen refuelling facility has potential to decarbonise the City's heavy vehicle fleet and boosts the GHG emissions abated by the ARRC precinct.

The main inputs to the Hydrogen facility are demineralised water and renewable power. Cooling water may also be required if evaporative cooling is the selected technology (as opposed to air-cooling). The hydrogen production process uses water in two main applications:

1. Water that is sent to the electrolyzers and directly converted to hydrogen.

-
2. Cooling water to remove heat from the process. This could be evaporative cooling, hybrid cooling or air cooling.

The power requirements are based on a pre-FEED study for the Hydrogen facility, and this is the basis for the energy calculations for this assessment. It is noted that there will be additional power draw for demineralisation of the water fed to the Hydrogen facility. At this stage, this power draw has been excluded from this analysis and is relatively small compared to the power draw for the electrolyser. Note, the renewable electricity generated by the residual WtE facility is not zero-emissions (due to combustion emissions). The combustion emissions have been factored into the overall carbon and energy balance for the ARRC as a whole. Hydrogen fuel cell vehicles (FCEVs) are generally more efficient than diesel combustion engines, so this efficiency gain has been factored into the calculation for switching from diesel to FCEVs. It has been assumed that 750 tonnes of hydrogen would be produced per year, which is a small-scale production output, which results in overall emissions reduction of 6,333 tCO₂-e per year by substituting diesel for hydrogen in City waste collection truck.

4.9.6 Summary and Conclusion

An assessment of emissions has been completed for each facility within the ARRC, with results presented by major emissions-contributing or consuming facilities, as well as for the ARRC as a whole. Both an LCA and a GHG assessment were completed to determine the impact of ARRC and each major facility on the City's emissions and ability to reduce emissions and contribute to net zero targets. While the emissions reductions for the residual WtE facility are negated by 2050 with the proposed decarbonisation of the Queensland power grid, the ability for the ARRC as a whole to reduce carbon emissions when compared to landfilling waste and utilising fossil fuel-derived energy sources is significant.

4.10 Traffic and Transport

4.10.1 Introduction, Purpose, and Scope

The ARRC project is likely to impact traffic and transport in the Stapylton region and require changes to intersections, traffic controls, and potentially the road network. To quantify these impacts and identify the potential requirements for traffic and transport as relevant to the LGID, the City commissioned WSP to complete a preliminary Traffic Impact Assessment (TIA). The following tasks were considered in the scope of the preliminary TIA:

- Consideration of baseline traffic conditions proximate to the project, including an assessment of existing road, intersections and vehicle access locations to be used by the project
- Description of the expected transport task during the construction phase of the project, defined as best as possible with available information at the time of the TIA
- Description of the expected transport task during the operational phase of the project, defined as best as possible with available information at the time of the TIA, including forecast traffic volumes associated with workforce, visitors and heavy vehicle movements
- An assessment of the expected transport impact of the project, prepared in accordance with guidance and requirements set out in the TMR “Guide to Traffic Impact Assessment” (GTIA) (December 2018)
- Identification of likely impact locations, including high level identification of methods and strategies to reduce and manage any identified transport impacts.

Noting that the ARRC is still in the design phase and facilities are not yet designed in detail, assumptions have been used to complete the preliminary TIA, with the best available data utilised to form a conservative but appropriate assessment. Future TIAs will be completed once each facility within the ARRC is refined and designs are further advanced where assessments are more accurate and specific.

4.10.2 Existing Conditions

The ARRC precinct is located in the suburb of Stapylton, with numerous State and local government-controlled roads comprising the surrounding road network. The network is shown in Figure 39 and a summary of the network characteristics is provided in Table 84, and key intersections in Table 85.

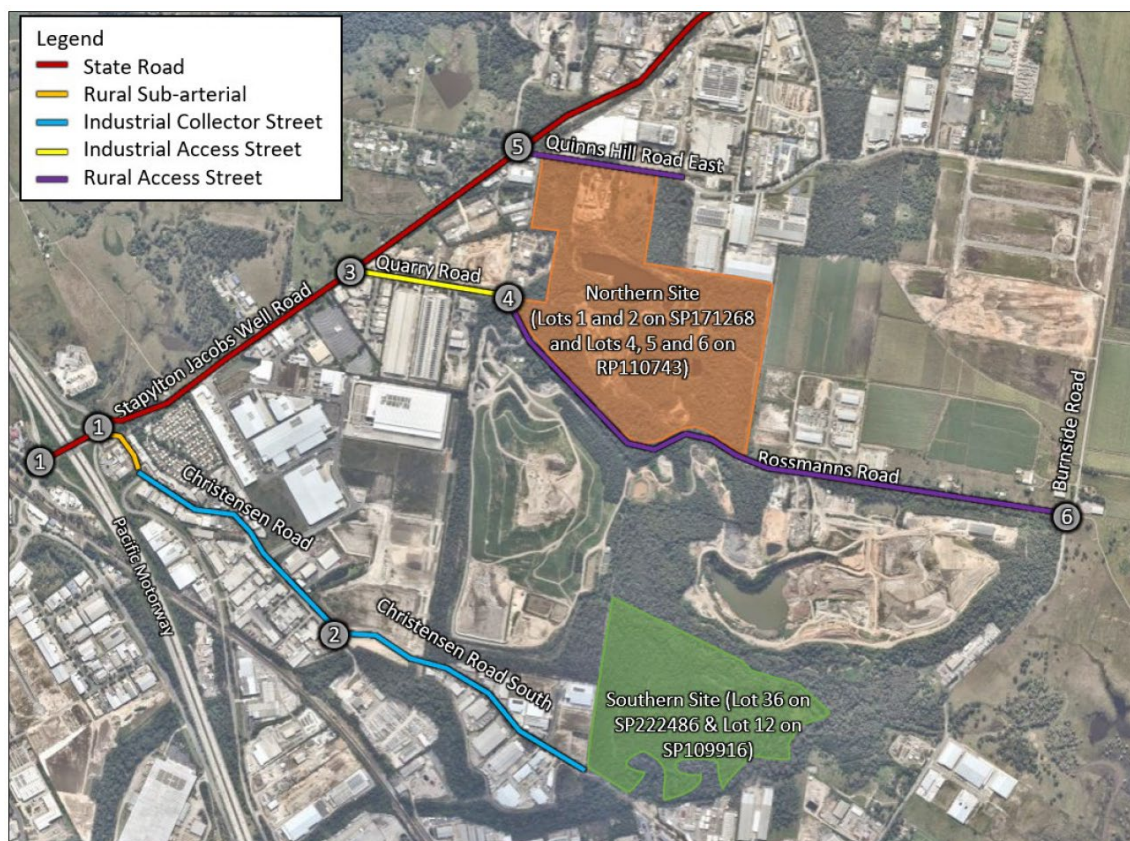


Figure 39 Surrounding road network

Table 84 Existing road network characteristics

	Stapylton Jacobs Well Road	Christensen Road	Quarry Road	Rossmanns Road	Quinns Hill Road East
Jurisdiction	TMR	Council			
Class Type	State Road Major Collector	Industrial Collector Street	Industrial Access Street	Rural Access Street	Rural Access Street
Posted Speed	60 kph	Unposted 50 kph	60 kph	60-80 kph	Unposted 50 kph
Lane Formation	2 lanes, undivided				
Carriageway Width	10 – 17m	7 – 12m	7 – 12m	9m	6 – 7m
Reserve Width	Varies ~30 – 50m	Varies ~20 – 30m	Varies ~20 – 30m	Varies ~30 – 60m	20m
Direct Access	Limited	Yes			
Average Daily Traffic (ADT)	~13,500 vehicles	~1,100 vehicles	~3,500 vehicles	~2,300 – 3,000 vehicles	~2,200 vehicles

Table 85 Key intersections

	#1	#2	#3	#4	#5	#6
Roads	Stapylton Jacobs Well Road / Pacific Highway	Christensen Road South / Christensen Road	Stapylton Jacobs Well Road / Quarry Road	Rossmanns Road / Quarry Road	Rossmanns Road / Burnside Road	Stapylton Jacobs Well Road / Quinns Hill Road East
Jurisdiction	TMR	Council	TMR	Council	Council	TMR
Control	Interchange Signalised Roundabout	Priority (Give-way)	Priority (Give-way)	Priority (Give-way)	Priority (Give-way)	Signals
Speed Limit	60 kph	50 kph	60 kph	60 kph	60 kph	60 kph

Background Traffic Conditions

Existing Traffic Volumes

Traffic counts were undertaken on Tuesday 28 June 2024 at Stapylton Jacobs Well Road / Quarry Road, Rossmanns Road / Quarry Road and Stapylton Jacobs Well Road / Quinns Hill Road East intersections for a 16-hr period between 4:00AM and 8:00PM. Traffic counts for the remaining intersections at the Stapylton Jacobs Well Road interchange with the Pacific Highway and Christensen Road South / Christensen Road were undertaken on Tuesday 12 November 2024 for a 16-hr period between 4:00AM and 8:00PM.

Road Safety

The crash history for surrounding roads provides background context into any pre-existing safety issues which may need to be mitigated as part of any future development. An analysis of the crash history was undertaken using publicly available data from Queensland Globe for a preceding 20-year time period. Crash history locations are shown in Figure 40.

A review of the crash data at the Stapylton Jacobs Well Road / Pacific Highway interchange found the following:

- Fifteen crashes (approximately 30% of all crashes) which resulted in hospitalisation
- Twenty-seven crashes (approximately 50% of all crashes) which resulted in medical treatment
- Twelve crashes (approximately 20% of all crashes) which resulted in minor injury.

The majority of these crashes were multivehicle crashes which is likely a result of the highly congested road environment.

A review of the crash data at Stapylton Jacobs Well Road corridor between the interchange and Quinns Hill Road East found the following:

- Nine crashes (approximately 40% of all crashes) which resulted in hospitalisation
- Nine crashes (approximately 40% of all crashes) which resulted in medical treatment
- Three crashes (approximately 20% of all crashes) which resulted in minor injury.

The majority of these crashes are multivehicle crashes, mostly occurring at intersections with lower order roads or private access points. The crash history along Stapylton Jacobs Well Road is also likely a result of the highly congested road environment.

A review of the crash data for Stapylton Jacobs Well Road / Quarry Road intersection found the following:

- Three crashes which resulted in hospitalisation, with all crashes occurring at the western approach of Stapylton Jacobs Well Road
- Two crashes which resulted in medical treatment, with one occurring at the western approach of Stapylton Jacobs Well Road and one occurring on the turn lane from the eastern approach.

The crash history indicates that the intersection may be experiencing congestion related issues, implied by the rear end crash types and right turning vehicles conflicting with the major movement. These types of crashes typically occur when intersection delays increase, and drivers attempt to negotiate movements with lower gap acceptance.

A review of the crash data for Stapylton Jacobs Well Road / Quinns Hill Road East intersection found the following:

- Two crashes which resulted in hospitalisation, with one occurring along the turn lane from the minor approach and one occurring in the middle of the intersection
- One crash which resulted in medical treatment, occurring in the middle of the intersection
- One crash which resulted in minor injury, occurring on Stapylton Jacobs Well Road in the middle of the intersection.

The incidence of multi-vehicle crashes is consistent with the crash history along the Stapylton Jacobs Well Road corridor. The crash history indicates that the intersection may be experiencing congestion related issues, with some additional safety concerns due to the atypical layout and longer distance required to travel between the yield points on Stapylton Jacobs Well Road.

A review of the crash data for Rossmanns Road found the following:

- One crash which resulted in hospitalisation, occurring along Rossmanns Road
- Two crashes which resulted in medical treatment, occurring along Rossmanns Road, east of the proposed site
- One crash which resulted in minor injury, occurring along Rossmanns Road along the frontage of the proposed ARRC site.

A review of the crash data for Christensen Road found:

- One crash which resulted in a fatality, occurring at the intersection of a private access with the road
- Three crashes which resulted in hospitalisation, with both occurring at intersections with other roads
- Two crashes which resulted in medical treatment, also occurring at intersection with other roads

- Three crashes which resulted in minor injury, occurring at intersections with other roads.

These crashes all occurred at the northern end of Christensen Road.

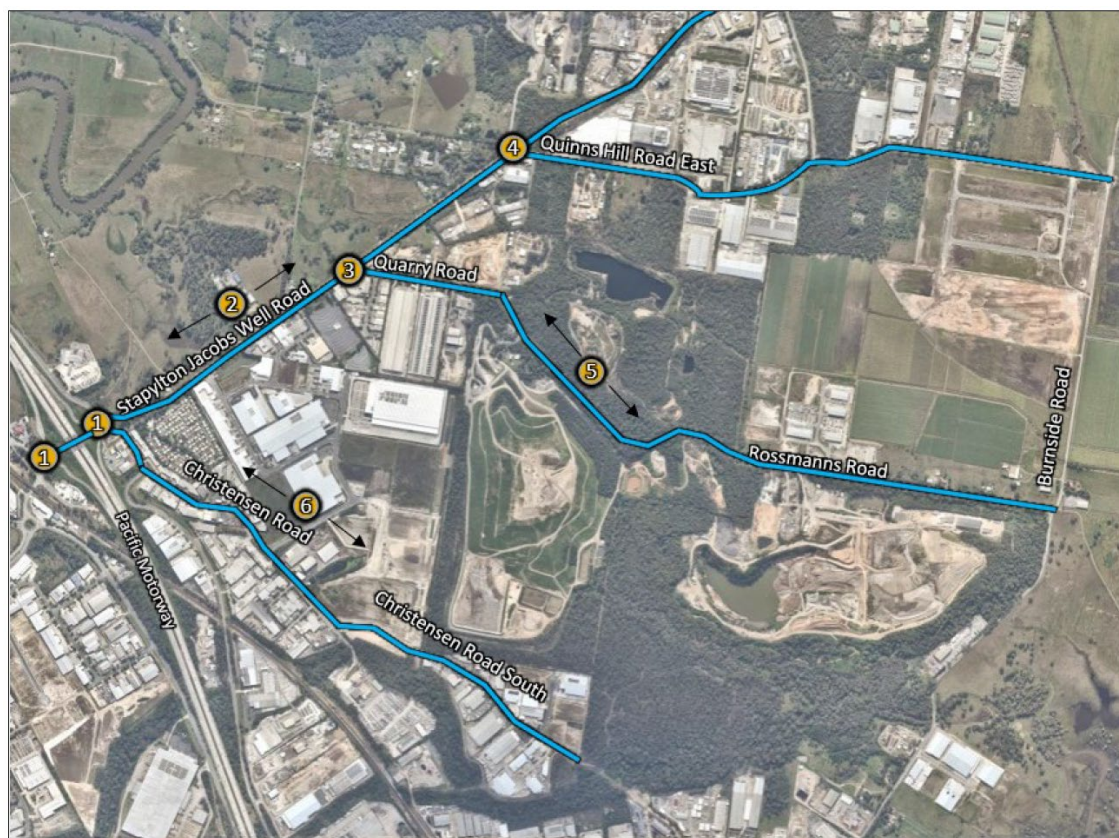


Figure 40 Crash history locations relevant to the ARRC precinct

Future Road Network Planning

The suburb of Stapylton is expected to undergo significant change into the future. As growth within the area occurs, further pressure will be placed on the existing transport infrastructure. To support this growth, several upgrades have already been identified by the City and TMR. A brief overview and description of these projects are set out as follows:

- Significant City upgrade program for Christensen Road to facilitate the local industrial catchment growth.
- TMR Coomera Connector project – multibillion dollar motorway duplication project with Stage 1 currently under construction (16km section between Coomera and Nerang). Proposed northern section extends the duplication 29km from Loganholme to Coomera and is expected to fundamentally alter the local transport network and traffic demands within Stapylton. Timing of this stage is unknown and may not be completed before 2040, so is unlikely to impact the ARRC during construction phases or potentially the first eight years following full commissioning.
- Stapylton Jacobs Well Road corridor planning – early consultation with TMR has indicated that corridor planning and preservation is underway, although details of this study were not available at the time of this assessment.

Active and Public Transport Infrastructure

Pedestrian infrastructure along the site frontages is generally limited. Along Quinns Hills Road East, there is a short, 1.2m wide pedestrian path along both sides of the road in the direct vicinity of the Stapylton Jacobs Well Road / Quinns Hill Road East intersection. The pedestrian paths terminate at the first driveway to the first development, where the road then changes to a rural formation, without any kerb and channel. Along the site frontage to the proposed ARRC Innovation Park and the MRF there is no dedicated pedestrian infrastructure. Along Quarry Road, between Stapylton Jacobs Well Road and Rossmanns Road, the provision of pedestrian paths is sporadic and disjointed. South of Quarry Road along Rossmanns Road, there are no pedestrian paths provided on either side of the road. At Christensen Road, 1.2m wide pedestrian paths are generally provided on both sides of the road. However, the pedestrian path at the end of Christensen Road South (i.e. at the cul-de-sac) terminates before the site frontage. Stapylton Jacobs Well Road also has limited provision for pedestrian movements. It is noted however, that the planning for this corridor includes a new pedestrian path on the southern side of the road, and some localised pedestrian path upgrades on the northern side. In line with the TMR safety policy, it could be expected that pedestrian crossing facilities would be provided at new signalised intersections.

There is currently no dedicated cycle infrastructure within vicinity of the ARRC. It is noted, however, that a two-way cycle track may be provided along the southern side of Stapylton Jacobs Well Road as part of the Stapylton Jacobs Well Road corridor upgrade.

To facilitate public transport use, it is generally desirable for developments to be located within 400m of a bus stop or within 800m of a train station or major bus interchange. The ARRC is located approximately 2.3km from the closest bus stop, which is located on Christensen Road near Stapylton Jacobs Well Road. This stop services bus route 728, which runs from Ormeau Station to Beenleigh Station at 1-hour frequencies. Based on this guideline, limited catchment and low frequency of service, the ARRC is considered to be very poorly serviced by public transport and as such, public transport has not been considered as a viable way of travelling to and from the site. However, this may change in the future with the Stapylton Jacobs Well Road corridor upgrade, and planning for this corridor includes a number of bus stops on the northern side of the road. As part of future planning for the ARRC, and in consideration that the ARRC will be a significant employment generator, there may be an opportunity to extend future bus services and routes to allow for sustainable travel modes to service the site.

4.10.3 Proposed Configuration and Requirements

Vehicle Access Strategy

Table 86 provides an overview of the vehicle access strategy for each ARRC facility.

Table 86 Vehicle access strategy for ARRC facilities

Facility	Vehicle Access Form and Location
MRF	Driveway access to Quinns Hill Road East, in accordance with Council Planning Scheme requirements and AS2890.1 and AS2890.2.
Innovation Park	Driveway access to Quinns Hill Road East, in accordance with Council Planning Scheme requirements and AS2890.1 and AS2890.2.

Facility	Vehicle Access Form and Location
Hydrogen Refuelling and Community Education Centre	Driveway access to the Quarry Road stub road, in accordance with Council Planning Scheme requirements and AS2890.1 and AS2890.2.
Residual WtE facility, mono cells, and ancillary infrastructure	<p>Two vehicle access points are proposed to Rossmanns Road, constructed as new intersections in accordance with Council Planning Scheme requirements and relevant Austroads Guidelines.</p> <p>Light and heavy vehicles are to be separated.</p> <p>The northern access to Rossmanns Road is envisaged to cater for heavy vehicle traffic, for vehicles up to and including B-Doubles. It is expected that this access will be constructed after the peak construction phase.</p> <p>The southern access to Rossmanns Road is envisaged to initially cater for construction traffic. Post-construction, it is expected that this access will cater for light vehicle traffic. Reduction of the posted speed limit on Rossmanns Road will be required to facilitate this access.</p>
Pipeline Easement	Not considered in this TIA but likely to require temporary vehicle access during construction via Rossmanns Road.

Car Parking

The arrangements for car parking within each site are yet to be detailed. However, it is assumed that the car parking demands of the ARRC will be wholly contained within each site and designed in accordance with relevant standards, guidelines and good transport engineering practice, in accordance with the City of Gold Coast “City Plan 2017”, Australian Standards (AS2890 series) and relevant Austroads Guidelines.

Active Transport Integration

The internal pedestrian connectivity and footpath network is yet to be detailed. However, it is expected that high-quality pedestrian pathways will be provided on desire lines between the key pedestrian demand generators within each site. The pedestrian pathway network will need to be cognisant of the prevailing traffic conditions and vehicle mix, with due consideration of pedestrian safety given the high volume of heavy vehicles moving throughout the precinct. Pathways which eliminate conflict with pedestrians and vehicles should be implemented where possible, and appropriate Safety in Design processes followed to ensure adequate safety is maintained throughout the Project life cycle.

The provision for bicycle parking and associated end-of-trip facilities is also yet to be detailed, however, should be considered in line with the provision of safe cycle facilities external to each site. Given the limited cycle infrastructure provided on the existing transport network, in combination with the high composition of heavy vehicle traffic, it is recommended to limit the provision of bicycle facilities until such time that the external cycle infrastructure is improved.

Public Transport Integration

The sites are currently poorly serviced by public transport. However, given that the northern ARRC site is expected to be a large employment generator, it is expected that the possibility of providing a direct bus route to/from the precinct will be further explored.

Planning for the Stapylton Jacobs Well Road corridor indicates that TMR is investigating the potential for providing a number of bus stops on the northern side of the road. It is possible that the existing bus route 728 to

Beenleigh and Ormeau Station is extended further into Stapylton, or another route added depending upon expected passenger demands. Should additional bus services be extended to Stapylton, opportunities for improved public transport integration will be investigated in collaboration with Translink.

4.10.4 Traffic Generation and Distribution

Traffic Demand Forecasts

The study network as assessed and modelled within this TIA includes the following key locations:

- Stapylton Jacobs Well Road / Pacific Highway interchange
- Christensen Road South / Christensen Road intersection
- Stapylton Jacobs Well Road / Quarry Road intersection
- Quarry Road / Rossmanns Road
- Rossmanns Road / Burnside Road
- Stapylton Jacobs Well Road / Quinn Hills Road (East)
- Rossmanns Road / Site Access 1 (Heavy Vehicle Access)
- Rossmanns Road / Site Access 2 (Light Vehicle Access).

The study network is shown in Figure 41.



Figure 41 Study network

Assessment Design Horizons

The design horizons for assessment follow the project schedule (Section 3.1). Traffic generation has been quantified for the following key project years:

- 2030: Peak construction phase
- 2032: Indicative year of opening for all ARRC uses
- 2044: Future year design horizon corresponding with the most relevant future planning horizon of the ARRC.

The 2044 design horizon notionally represents an assessment period 10-years after the year of opening. Whilst the impacts of staged opening and implementation of the Project has not been undertaken as part of this TIA, it is expected that further traffic assessments will be completed as the project progresses.

Project Traffic Generation Assumptions

Preliminary forecasts for traffic generation have been based on the best available knowledge of the project to date and are subject to change as planning for the ARRC progresses. It is expected that the Project will continue to investigate traffic demands as more details emerge, and resultant traffic impacts investigated in close consultation with TMR and Council.

As the ARRC is planned to address future capacity issues at existing landfill sites, it is expected that a portion of the generated vehicle trips are likely to be rediverted trips from the wider Gold Coast region. It is therefore

reasonable to expect that a portion of vehicle trips to / from the ARRC will be preexisting trips already present on the existing road network. The analysis contained in this TIA does not make any adjustment for these pre-existing trips and therefore, the impacts described in this report are potentially conservative on the high-side.

Excluded Project Components

A summary of excluded ARRC components in the construction phase (operational volumes have been included) which will require further investigation at a later stage include:

- Innovation Park
- Mono cell (bulk earthworks) construction workforce
- Hydrogen refuelling facility
- Community Education Centre
- Access track clearing footprint for the pipeline easement

Other Project elements have been defined at a high level, with Project traffic generation estimates subject to change as planning for the project evolves. Where any significant changes to trip generation occurs, it is expected that further assessments will be undertaken to determine any changes to expected traffic impact.

Project Traffic Generation and Distribution Estimates

The project traffic generation estimates for the 2030, 2032 and 2044 design years are summarised in Table 87, Table 88 and Table 89. The volumes represent 2-way traffic, taking into account all movements expected to enter and exit the site during the peak hour periods.

Table 87 Project traffic generation (2030) - peak construction period (2-way trips)

Facility / Activity	Trip Type	Peak Hour (vehicles/hr)
Residual WtE	Light Vehicles (workers)	450
	Trucks	84
MRF	Light Vehicles (workers)	56
	Trucks	2
Bulk Earthworks	Trucks	12
Total	Light Vehicles (workers)	506
	Trucks	98
	Total Vehicles	604

Table 88 Project traffic generation (2032) – year of full commissioning/operation (2-way trips)

Facility / Activity	Trip Type	Peak Hour (vehicles/hr)
Residual WtE	Light Vehicles (staff and contractors)	214
	Light Vehicles (visitors)	25

Facility / Activity	Trip Type	Peak Hour (vehicles/hr)
	Trucks	114
MRF	Light Vehicles (staff and contractors)	113
	Trucks	67
Mono Cells	Light vehicles (staff)	2
	Trucks	1
Hydrogen Refuelling	Light Vehicles (staff)	6
	Light Vehicles (visitors / customers)	8
	Trucks (customers)	2
Community Education Centre	Light Vehicles (staff and visitors)	126
Innovation Park	Light Vehicles (staff)	54
	Trucks	23
Total	Light Vehicles (workers)	548
	Trucks	237
	Total Vehicles	785

Table 89 Project traffic generation (2044) – future year design horizon (2-way trips)

Facility / Activity	Trip Type	Peak Hour (vehicles/hr)
Residual WtE	Light Vehicles (staff and contractors)	214
	Light Vehicles (visitors)	25
	Trucks	114
MRF	Light Vehicles (staff and contractors)	97
	Trucks	82
Mono Cells	Light vehicles (staff)	2
	Trucks	2
Hydrogen Refuelling	Light Vehicles (staff)	16
	Light Vehicles (visitors / customers)	16
	Trucks (customers)	4
Community Education Centre	Light Vehicles (staff and visitors)	126
Innovation Park	Light Vehicles (staff)	54

Facility / Activity	Trip Type	Peak Hour (vehicles/hr)
	Trucks	23
Total	Light Vehicles (workers)	550
	Trucks	255
	Total Vehicles	805

Traffic distribution assumptions for 2030, 2032, and 2044 design years have been documented in the full TIA report. Trip assignment has assumed that all vehicles will originate or be destined to the M1, in accordance with the trip distribution inferred by the traffic counts. This will likely change with the introduction of significant projects such as the Coomera Connector, and whilst some high-level consideration of the impact of the Coomera Connector has been included within the project access requirements, no further consideration has been undertaken for the intersection impact assessment.

Background Traffic Growth

Traffic volumes into the future will likely change with a number of significant planned road infrastructure projects, including:

- Pacific Motorway / Stapylton Jacobs Well Road interchange upgrade and associated Stapylton Jacobs Well Road four-lane upgrade to Woolshed Road
- Signalised intersection upgrades at the key intersections of Stapylton Jacobs Well Road with Quarry Road and Stapylton Jacobs Well Road with Quinns Hill Road East (amongst others along the corridor)
- Coomera Connector Stage 2, and in particular, two new interchanges proposed at Burnside Road and Stapylton Jacobs Well Road.

Additionally, the wider Stapylton area is earmarked for significant development, which will change the future traffic demands and distribution throughout the area. Given the nature of the changes expected into the future, in combination with the likely network changes occurring as a result of ARRC, it is important to gain an understanding of future transport demands and distribution through more sophisticated means such as strategic transport modelling. Manually derived cumulative impacts have informed demands distributed in accordance with the existing transport network; however, they do not consider the impact of significant projects such as the Stapylton Jacobs Well corridor upgrade and future Coomera Connector.

The City is currently undertaking model refinements for this area and, once a more robust strategic transport model is developed, this TIA will be reviewed and updated based on the most recent strategic modelling outputs. In recognition that there is currently significant traffic congestion along the Stapylton Jacobs Well Road corridor, including the connecting interchange with the Pacific Motorway, the potential for significant traffic growth is limited. The existing road network has limited capacity to accommodate additional traffic, and therefore an annual growth rate of 1% per annum has been applied to the 2024 traffic counts.

Cumulative Impact of Development

There are a number of developments already approved within Stapylton, which have the potential to increase traffic demands throughout the immediate area. This TIA has identified adjacent development and associated future transport demands (where possible), which have been compiled for consideration in a cumulative impact assessment.

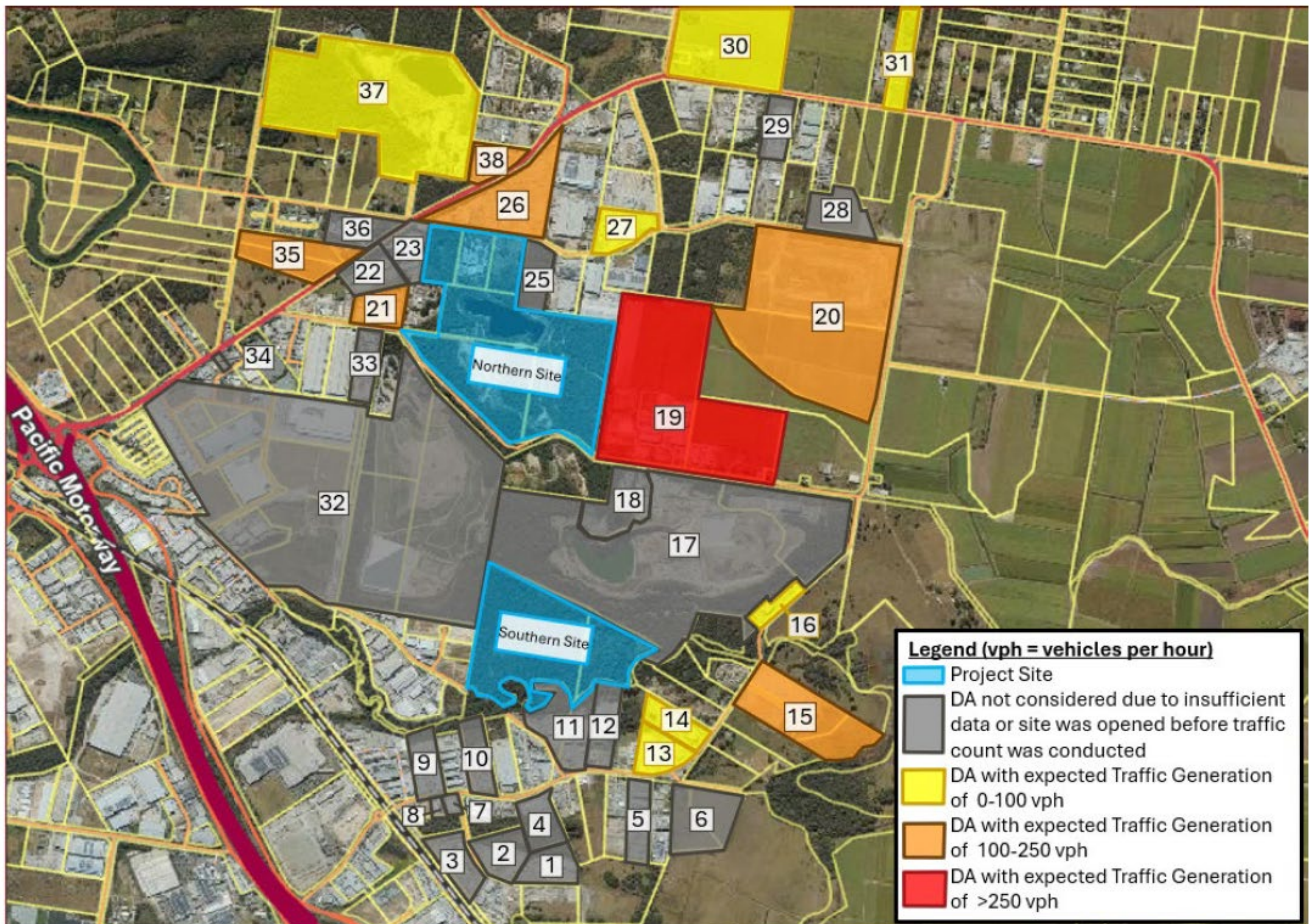


Figure 42 Adjacent development cumulative impact assessment

4.10.5 Assessment Methodology, Findings and Proposed Approach

Intersection Assessment

Methodology

The intersection assessment completed followed guidance and requirements with respect to the applicable road authority, including:

- For TMR controlled intersections, assessment has been undertaken in accordance with the GTIA (December 2018)
- For Council controlled intersections, assessment has been undertaken in accordance with the City of Gold Coast City Plan.

The key point of difference in the assessment methodology is that TMR requires assessment for external intersections (i.e. those intersections which do not provide direct access to the development) to be undertaken

at the year of opening. Council requires assessment for external intersections at the year of opening and then a subsequent 10-year design horizon.

For each assessment year, a number of scenarios were modelled, including:

- BG: Background traffic, representing operational performance without the ARRC (also known as the 'base case')
- BG + Construction: Peak construction demands associated with the ARRC, overlaid on forecast background traffic volumes at 2030
- BG + ARRC: Operational demands associated with the ARRC, either at the year of opening for all ARRC uses or a 12-year design horizon, overlaid on forecast background traffic volumes at the respective years of 2032 or 2044 (note 2044 is for Council intersections only)
- BG + ARRC (Construction / Operations) + Cumulative Impact: A theoretical scenario where all the currently approved projects within Stapylton are built and delivered in accordance with the assumptions contained within each DA package.

In addition to the above, existing conditions models were also prepared to ensure the SIDRA models were suitably calibrated. The abovementioned future year models are based on the calibrated 2024 base case models.

Performance Criteria

The operation of nominated intersections has been assessed using SIDRA Intersection (v9.1). SIDRA is an industry recognised computer-based modelling tool which calculates intersection performance. The commonly used measures of intersection performance are the Degree of Saturation, the Level of Service, the Average Delay experienced by the worst-performing leg of the intersection and the 95th percentile queue of the worst-performing movement of the intersection. In assessing the operational performance of intersections, failure conditions occur when one or more of the following performance parameters has been breached.

Intersection Impact Summary Findings

A summary of the findings of the intersection impact assessment is presented in Table 90.

Table 90 Intersection impact summary

Intersection	Project Impact?	Potential Mitigation
Stapylton Jacobs Well Road / Pacific Highway Interchange	Yes	The interchange is expected to fail by 2030. Strategies to reduce and manage the identified impact will be developed in close consultation with TMR as the project progresses through detailed design. Strategies will include consideration of current planning projects already been undertaken by TMR, such as the Stapylton Jacobs Well corridor upgrade and future Coomera Connector.
Christensen Road South / Christensen Road	No	No mitigation is required at this location as it is expected to operate adequately under all scenarios assessed.

Intersection	Project Impact?	Potential Mitigation
Stapylton Jacobs Well Road / Quarry Road	Yes	This intersection is expected to fail by 2030. Mitigation of project impact at this location is expected to include a contribution towards a future signalised upgrade, generally aligning with the corridor envisaged as part of the TMR proposed Stapylton Jacobs Well Road upgrade. Additional intersection upgrade requirements could be triggered by ARRC, such as dual right turn lanes at Stapylton Jacobs Well Road into Quarry Road.
Rossmanns Road / Quarry Road	Yes	This intersection is expected to fail in 2044 under the cumulative impact scenario only. However, due to preexisting safety concerns at this intersection, it is recommended to upgrade this intersection to signals in readiness for the year of opening for the full ARRC.
Rossmanns Road / Burnside Road	No	No mitigation is required at this location as it is expected to operate adequately under all scenarios assessed.
Stapylton Jacobs Well Road / Quinns Hill Road East	Yes	This intersection is expected to fail by 2030. Strategies to reduce and manage the identified impact will be developed in close consultation with TMR as the project progresses through detailed design. Strategies will include consideration of current planning projects already been undertaken by TMR, such as the Stapylton Jacobs Well corridor upgrade. Further, investigation into providing inter-site connectivity within the northern precinct will be progressed as a potential measure to reduce transport demands on the external road network.

Project Access Requirements Assessment

Initial considerations for vehicle access include whether the vehicle access location requires turning treatments. The warrants for turn treatments provide guidance where deceleration lanes and turning lanes should be used, based on forecast traffic volumes. A preliminary assessment of requirements has been undertaken in accordance with the Austroads “Guide to Traffic Management Part 6”, which is accepted methodology for use under the Gold Coast City Plan.

Typically, vehicle access locations are assessed at key design years, notionally upon the year of opening and a subsequent 10-year design horizon. The turn warrant assessment for each component of the ARRC is set out in the following sections. Two scenarios were modelled, namely the 2044 design horizon, including only the ARRC, and then a separate scenario which includes ARRC and cumulative impact traffic. The requirement for sight distance is based on whether the access is proposed as a driveway or an intersection. Where the site access is proposed as a driveway, the driveway will need to comply with guidance set out in the Australian Standard “Parking Facilities Part 2: Off Street Commercial Vehicle Facilities” (AS2890.2). Where the site access is proposed as an intersection, the intersection will need to comply with the criteria outlined within Austroads AGRD-04A. Where the vehicle access is proposed as an intersection, a SIDRA assessment has been undertaken. Detailed assessments for each facility, including turn warrant assessment and sight distance requirements, are provided in detail in the full TIA report. A summary of the findings is provided below:

- **MRF:** Design of the access driveway to include a short right turn lane into the facility driveway from Quinns Hill Road East. There is a crest on Quinns Hill Road East approximately 45m west of the western lot

boundary, and a curve in the road approximately 90m east of the eastern lot boundary. Given the site frontage is approximately 150m, it is expected that the driveway can be located such that these minimum sight distance requirements are met.

- **Innovation Park:** Turn warrant assessment determined that a channelised right turn into the driveway will be required. There are two crests on Quinns Hill Road East which may potentially affect the site access location. These crests are located approximately 70m and 290m east of the Stapylton Jacobs Well Road / Quinns Hill Road East intersection. Given the site frontage to Quinns Hill Road East is approximately 300m, it is expected that the driveway can be located such that these minimum sight distance requirements are met.
- **Hydrogen Refuelling and Community Education Centre:** Turn warrant assessment determined that no additional turning lanes are required to facilitate these facilities. There are two sight distance restrictions which may potentially affect the vehicle access location. The first is a curve in the road, approximately 30m east of the Rossmanns Road / Quarry Road intersection. Once on Quarry Road, the road follows at steep vertical alignment, with a crest located approximately 240m east of the Rossmanns Road / Quarry Road intersection. The site fronts the entire section of the Quarry Road stub road, though the road reserve is only 135m in length from the tangent point of the Rossmanns Road / Quarry Road intersection.
- **Residual WtE and Mono Cells Precinct (Heavy Vehicles):** A dedicated vehicle access for heavy vehicles is proposed to Rossmanns Road from the northern site, along Rossmanns Road directly south of the existing Stapylton landfill. Rossmanns Road is not currently on the City's functional road hierarchy, however, this could change in the future as Rossmanns Road will provide a key east-west linkage between the M1 and future Coomera Connector Stage 2. Given the future function of Rossmanns Road, any new vehicle access to Rossmanns Road should be of higher order treatment. As such, the heavy vehicle access is proposed to be constructed as an intersection. The turn warrant assessment determined that a channelised left turn into the site for heavy vehicles. The intersection provides 320m sight distance (looking north) and 315m (looking south), thus complying with the minimum requirements. It is further noted that the intersection is appropriately set back from the adjacent Stapylton Landfill access and is therefore not expected to impact on existing infrastructure. In the future, SIDRA modelling indicated that at the 2044 design horizon the intersection may need to be signalised.
- **Residual WtE and Mono Cells Precinct (Light Vehicles):** A dedicated vehicle access for light vehicles is proposed to Rossmanns Road from the northern site, directly adjacent to the eastern property boundary. This intersection is also proposed as the primary access intersection during construction. The turn warrant assessment determined that a channelised left turn into the site for heavy vehicles. If traffic volumes significantly increase on Rossmanns Road as a result of Coomera Connector. As such, it is recommended that the intersection design for the light vehicle access includes provision for a higher order turn treatment. be reduced to 60km/hr, resulting in a design speed environment of 70km/hr. Under this speed environment, the minimum required sight distance reduces to 161m (looking west) and 163m (looking east).

4.10.6 Summary and Conclusions

Based on the analysis completed for the preliminary TIA, the following conclusions have been made:

-
- Initial traffic generation forecasts for the ARRC indicate that the project could generate in the order of 730 new vehicle trips during both morning and afternoon peak periods, for the peak year of construction (2030).
 - Initial traffic generation forecasts for the year of opening (2032) indicate that the project could generate in the order of 800 new vehicle trips during both morning and afternoon peak periods.
 - Traffic generation forecasts for a future year design horizon (2044) indicate that the project could generate in the order of 820 new vehicle trips during both morning and afternoon peak periods.
 - The traffic generating potential for ARRC has been based on the best available knowledge of the project to date and are subject to change as the design progresses. It is expected that the project will continue to investigate traffic demands as more details emerge, and resultant traffic impacts and mitigation strategies investigated in close consultation with TMR and Council.
 - Based on the above trip generation, and other traffic demand assumptions as documented within this report, project impacts to the existing transport network are expected at:
 - Stapylton Jacobs Well Road / Pacific Highway Interchange
 - Stapylton Jacobs Well Road / Quarry Road intersection
 - Rossmanns Road / Quarry Road intersection
 - Stapylton Jacobs Well Road / Quinns Hill Road East.
 - TMR's planning for the Stapylton Jacobs Well Road corridor are expected to improve future operational performance. Strategies to further reduce and manage the identified project impacts will be developed in close consultation with TMR and Council as the project progresses through detailed design.
 - Requirements for vehicle access to the ARRC are documented within this report. A high-level summary of requirements follows:
 - MRF: vehicle access driveway with initial provision for channelised turn treatment at the year of opening and future provision for channelised turning lane treatment into the site.
 - Innovation Park: vehicle access driveway with no requirement for turning treatments at the year of opening, with future provision for channelised turning lane treatment.
 - Hydrogen refuelling and community education centre: vehicle access driveway with no requirement for additional turning treatments.
 - Northern site – heavy vehicle access: priority-controlled intersection with initial provision for auxiliary lanes / basic right turn treatments. Upgrade to signalisation and channelised turning lanes may be required in the future depending on the rate of development along Rossmanns Road.
 - Northern site – light vehicle access: priority-controlled intersection with initial provision for auxiliary lanes / basic right turn treatments. Upgrade to channelised turning lanes may be required in the future depending

on the rate of development along Rossmanns Road. Note that this access is only viable should the posted speed limit on Rossmanns Road be reduced to 60km/hr.

- Construction traffic management will be required in 2030, to manage expected impacts at the northern site – light vehicle access.

4.11 Public Utilities

A public utilities assessment has been conducted on the basis of the design presented in Appendix A. At the current design stage, a number of assumptions were made to determine the expected demand for the various services and utilities by each facility in the ARRC precinct.

4.11.1 Water and Sewerage Infrastructure

Existing water and sewerage infrastructure surrounding the ARRC precincts is shown in Figure 43.

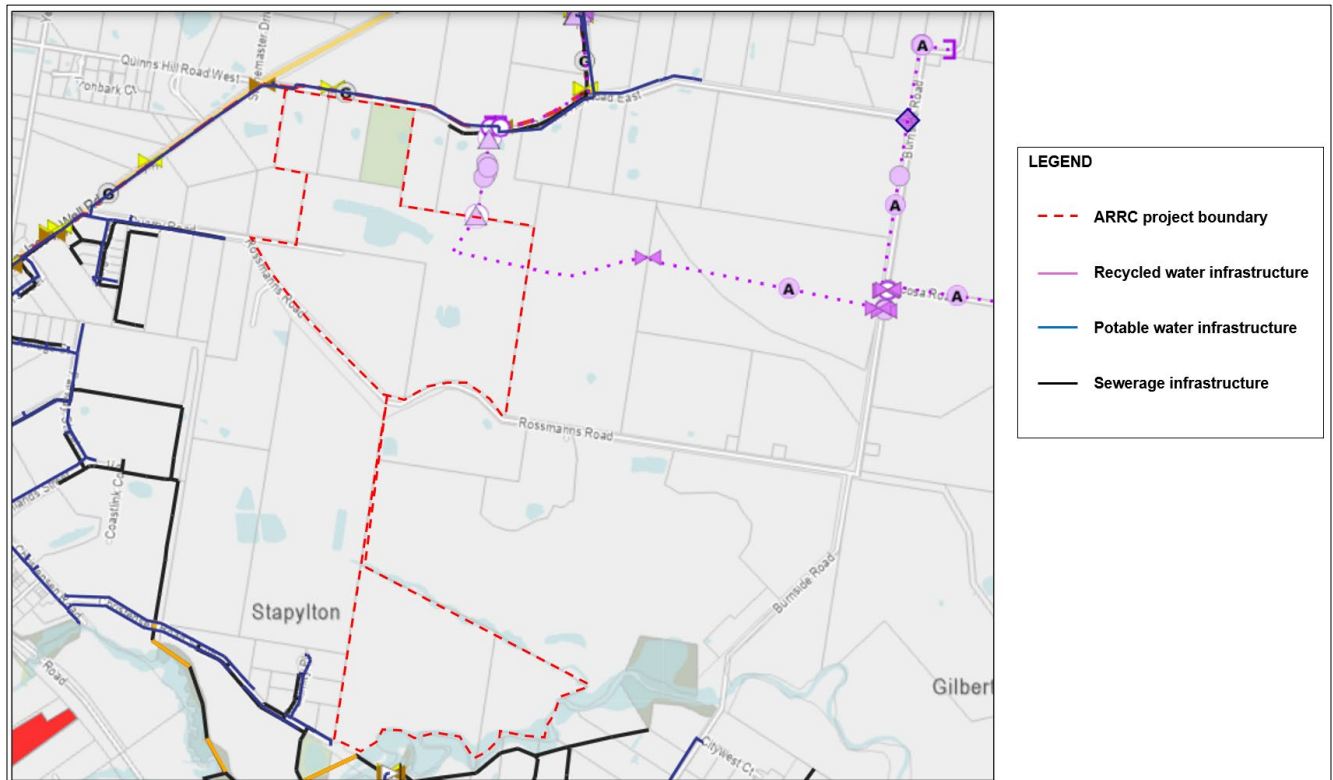


Figure 43 Existing potable water, recycled water, and sewerage infrastructure in the vicinity of the ARRC precincts

Sewer Network

The existing sewer system surrounding the site was reviewed using the City's online infrastructure assets map, where a sewer pump reservoir located on Stapylton Jacobs Well Rd near the Yatala Drive-in has been identified as the discharge point for sewage from the ARRC's northern precinct. It is anticipated that the residual WtE facilities daily sewage discharge of 3.90 kL will be required to be sent to this discharge point, the Community Education Centre is estimated to send 5.21 kL of sewage, the MRF is estimated to send 0.64 kL of sewage, and the Innovation Park estimated to send approximately 1.94 kL per day.

The City is currently in the process of upgrading the Stapylton sewer catchment and, therefore, by the commissioning date of the various ARRC facilities, the sewerage network is expected to have sufficient capacity to manage the additional load from ARRC's northern precinct.

Potable Water

Existing potable water surrounding the site was reviewed using the City's online infrastructure assets map. According to the assets map a buried DN250 PVC pipe located along Quinns Hill Road East, north of the ARRC

precinct, running west to east can supply the 411.84 kL daily potable water demand to the residual WtE facility. This supply is also sufficient to supply the 6.4 kL daily potable water demand for the Community Education Centre, the 1.84 kL daily potable water demand for the MRF, and the 5 kL daily potable water demand for the Innovation Park.

Potable water infrastructure is available along Christensen Road South; however, it is likely that this infrastructure will require upgrading in order to supply sufficient potable water to the southern precinct. The demand calculations are yet to be finalised; however, the City's potable water planning team are a key stakeholder in the development. It should be noted that fire suppression water utilising the potable water network in combination with on site storage will be included in the final demand assessment and requirements for network upgrades.

4.11.2 Electricity, Gas, and Telecommunications

Existing electricity and stormwater infrastructure surrounding the ARRC precincts is shown in Figure 44. Note that stormwater management has been addressed in Section 4.2

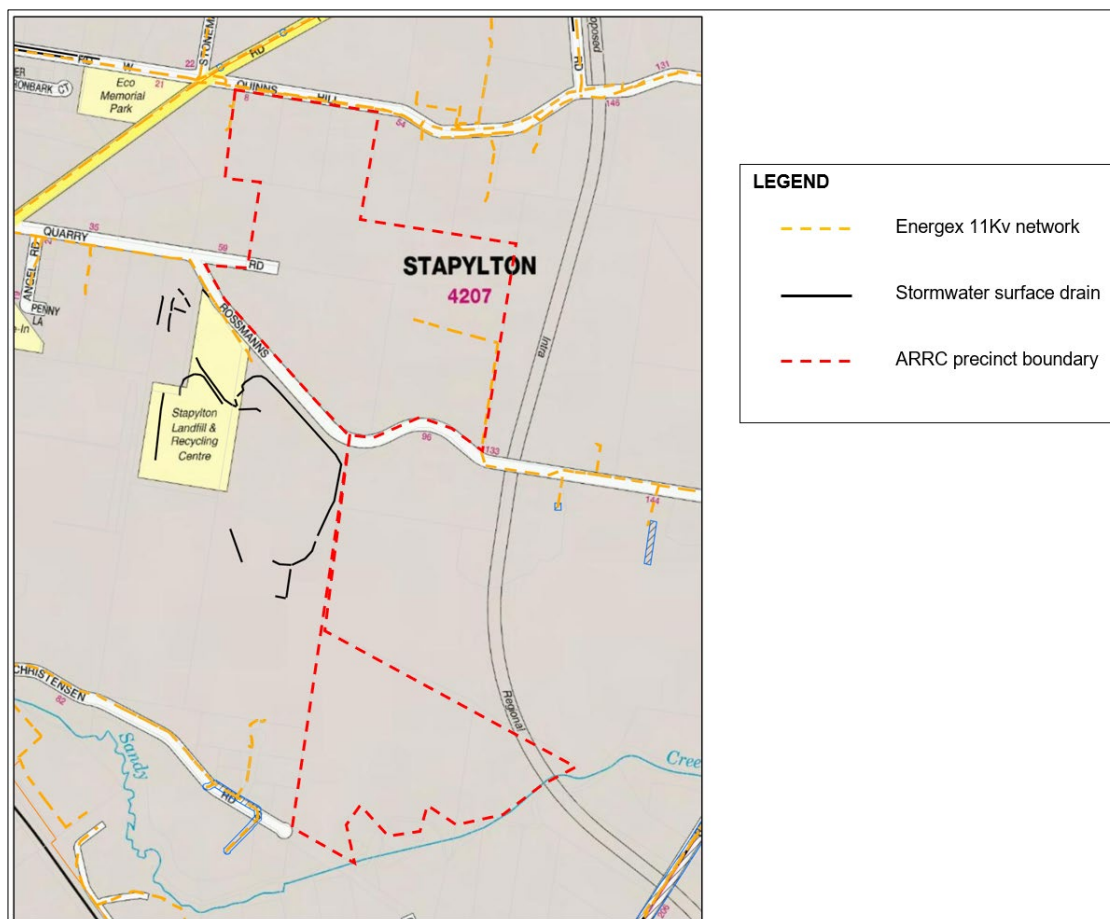


Figure 44 Existing electrical, communications, and stormwater infrastructure in the vicinity of the ARRC precincts

Electricity

It is anticipated that the residual WtE facility will produce sufficient power output to supply the full ARRC precincts, including all facilities. The mono cells, secondary processing at the residual WtE facility (IBA and APCr), Community Education Centre's 1MW low voltage power will be sourced via a new connection to the

existing LV pole located on Quinns Hill Road East to the north of the ARRC precinct. Similarly, this connection will also supply the MRF's power demand of 2 MW low voltage power, and the 9.4 MW low voltage power demand anticipated for the Innovation Park.

Energex has been engaged to identify the impact and associated infrastructure upgrades required for the 80 MW HV power export from the residual WtE facility, and a new HV switchyard will be located at the northeastern boundary of the ARRC precinct.

Telecommunications

Fibre to the Node NBN is available for all facilities in the ARRC precincts. Connections to NBN and telephony will be required as each facility becomes operational.

Gas

The residual WtE will require gas during start-up, which could occur twice a year considering major overhauls, with an estimated annual gas demand of 38,238 GJ. The Community Education Centre is anticipated to have a natural gas demand of 0.89 kL, the MRF demand anticipated to be 0.25 kL, and 0.75 kL for the Innovation Park. The natural gas for ARRC precinct will be source from the existing buried DN100 APA gas pipeline located along Stapylton Jacobs Well Road, which is considered sufficient to supply the site for the purpose.

4.12 Key Resource Areas and Transport Routes

4.12.1 Existing KRAs

Key Resource Areas (KRAs) are identified and regulated under the SPP to ensure that resources are protected from development that could compromise the ability to extract and transport them. Within the vicinity of the ARRC there is a KRA (KRA 69) covering 3WD6397 north of the ARRC site off Jacobs Well Road, and 2SP279441 south of the northern ARRC precinct and north of the southern ARRC precinct, off Rossmanns Road. KRA 69 is owned and operated by BMI Resource Recovery. Both sites are former extractive industry (quarry) sites that are now utilised for landfills and waste management activities; however, the Environmental Authority for both sites includes ERA 16 for Extraction and Screening, allowing resource extraction to occur at both sites. As such, both Stapylton Jacobs Well Road, Quarry Road, and Rossmanns Road are mapped as KRA transport routes and have separation areas around the routes, as well as the processing areas (Figure 45).

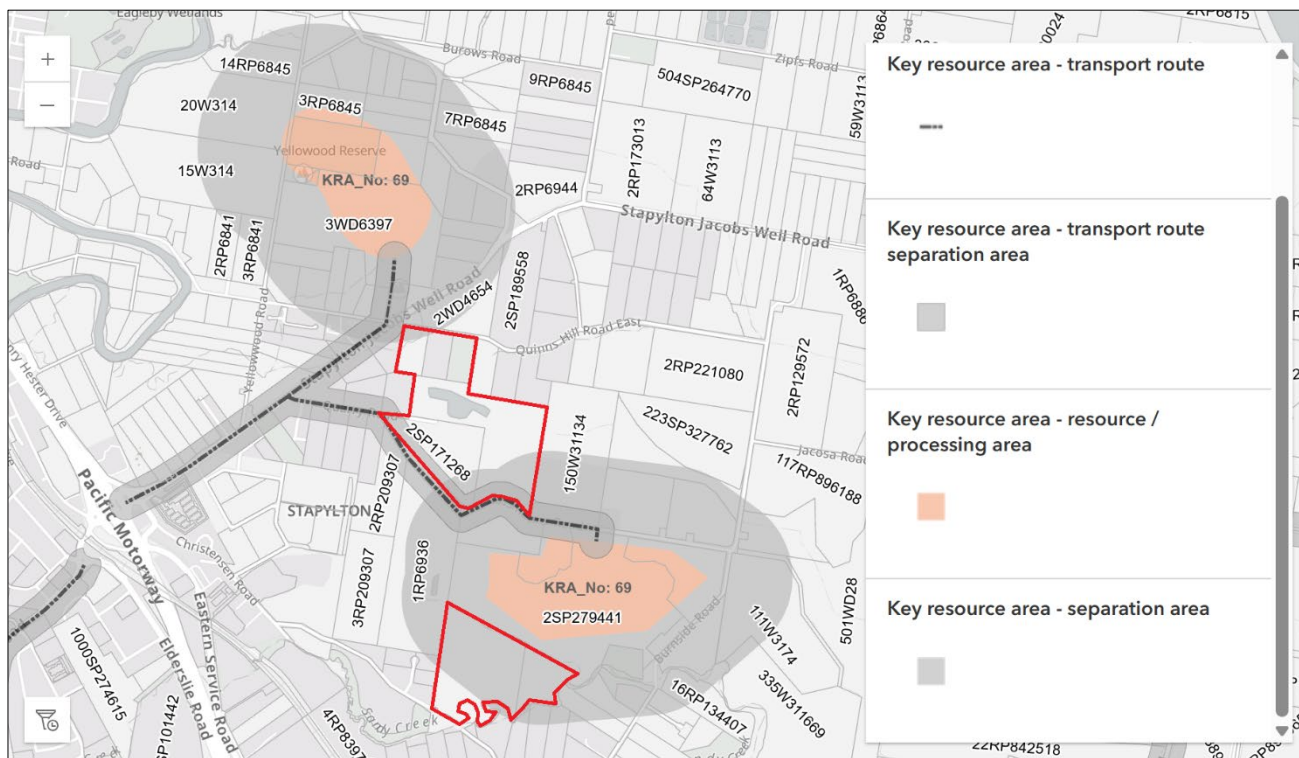


Figure 45 KRA processing, separation, transport, and transport separation areas (SPP IMS, 2025) with the ARRC lot boundaries shown in red.

4.12.2 Impact to KRAs from the ARRC LGID

The proposed ARRC facilities are considered compatible with extractive resource activities, noting that ARRC involves waste management and resource recovery, which is similar to the activities occurring at BMI. The Community Education Centre would be the only facility that potentially could be incompatible with extractive resource activities; however, it is proposed to be located outside of the KRA separation area boundary. The ARRC as a whole, including the Community Education Centre, is not considered a sensitive land use and therefore would meet Assessment Benchmark 2 of the SPP.

The ARRC construction and operational activities involve increasing both heavy and light vehicle usage on Stapylton Jacobs Well Road, Quarry Road, and Rossmanns Road (construction only) which will interact with the

KRA transport route. A preliminary TIA has been conducted and is summarised in Section 4.10 and provides an overview of the expected increase in traffic and impacts to the roads utilised for ARRC. While an impact to the road network is expected, the extent of necessary upgrades, the timing, and appropriate correspondence and engagement with stakeholders, including the relevant State Government departments, will occur as part of the detailed TIA, which will be completed once the design of each facility, and the precinct master plan develops and progresses. ARRC is not expected to have a significant impact on the KRA transport route; however, as upgrades will be required to accommodate ARRC's traffic.

Activities occurring on the ARRC sites are expected to be outside the KRA transport separation areas as vegetation buffers along Rossmanns Road, Quarry Road, and Stapylton Jacobs Well Road will be maintained in these separation areas to both protect workers at the ARRC precinct facilities from road noise, dust, and vibration, and to reduce the impact of the ARRC facilities on the local visual amenity. As such, the development is expected to meet Assessment Benchmark 3 of the SPP.

4.13 Construction Environmental Management

The City has a well-established and stringent process for ensuring environmental impacts are properly managed and mitigated through construction. The process for determining the appropriate levels of management is detailed below:

1. An Environmental Risk Assessment is conducted with the engineering design team and the construction contractor to identify potential risks to the environment during construction. It is integral that the construction contractor is included in this process to ensure that risks are fully understood, documented, and acknowledged.
2. A Construction Environmental Management Plan (CEMP), using the *Requirements for the Development of the Construction Environmental Management Plan*, is to be developed for all environmental risks identified, regardless of the severity ranking of the risk.
3. Sub-plans that are specific to the project, the site, and the construction activities are developed for risks identified and ranked as being moderate or higher in the risk ranking process.

The City has developed standards, templates, and guidance documents that are provided at the time of tender to all prospective construction contractors. It is a condition of the contract to meet these standards and develop and implement compliance CEMP documentation.

The documentation that has been prepared to guide, direct, and assist in the identification of environmental risk, development of appropriate processes and plans, and to enable consistent implementation is detailed below:

- Environmental Risk Assessment Guideline
- Requirements for the Development of the Construction Environmental Management Plan
- Dewatering and Groundwater Management Minimum Standards Guidance Document
- Groundwater and Dewatering Management Subplan Template
- Acid Sulfate Soils Subplan Template
- Erosion and Sediment Control Subplan Template
- Weed and Pest Management Subplan Template
- Air Quality Management Subplan Template
- Contaminated Land Management Subplan Template
- Hazardous Substances Management Subplan Template
- Surface Water Management Subplan Template
- Flora and Fauna Management Subplan Template

Throughout construction, periodic inspections of compliance with the CEMP documentation are complete in partnership with the Site Supervisor and/or the Contractor's environmental representative to ensure that the

commitments made in the CEMP documentation are being implemented, and that impacts to the environment are being adequately mitigated and controlled.

5. Consultation

5.1 Pre-lodgement Consultation

5.1.1 Local Government

This report, along with its appendices, is to be provided to Council for discussion and resolution to proceed with the process of engaging with the Minister and submission via the Infrastructure Designations portal. The report is due to be discussed by the City's Water, Waste and Energy Committee on 22 July 2025, before being endorsed by full Council on 29 July 2025.

On completion of State assessment and receipt of the Minister's endorsement has been received, a revised version of this report, addressing all comments and recommendations from the consulted parties, will be submitted to Council with a recommendation to designate the premises under an LGID.

5.1.2 State Government

The State Government shall be engaged through the Infrastructure Designations team within DSDIP, in the first instance via a request for a pre-lodgement meeting, followed by submission of the EAR via the Infrastructure Designations portal. Coordination of feedback, requests for further information, and responses will be conducted by the DSDIP Infrastructure Designations team.

On resolution by Council to designate the premises under an LGID, the relevant updated and final report, along with associated LGID documentation, will be made available to the Minister in accordance with the requirements of the Guidelines.

5.2 Public Consultation Strategy

5.2.1 Engagement and Communication for the ARRC

A comprehensive Early Engagement and Communication Plan (Phase 2) for the ARRC in its entirety has been developed for the project to identify key stakeholders, set out the community engagement strategy, identify key risks and key messages for the project, and set out engagement and consultation schedules and planning requirements. This Plan directs all engagement and communication for the project as a whole, particularly in the context of public media coverage of the project and ensuring the identified key stakeholders and community are kept informed and engaged throughout the life of the project.

Utilising this Plan, an LGID-specific Stakeholder Engagement Strategy has been set out in the following sections of this EAR. The Strategy seeks to minimise the duplication of engagement and consultation, avoiding over-consultation or consultation fatigue, but utilises the extensive engagement and consultation already underway for the ARRC as a whole for the purpose of ensuring relevant persons and parties are consulted and informed about the proposed LGID. Consultation has been undertaken and is considered ongoing with numerous stakeholders in the vicinity of the ARRC development, including adjacent business owners, operations in the area similar in nature to the ARRC (i.e., landfills and waste management centres), and stakeholders that may be impacted by the development. Under the ARRC Stakeholder Engagement Strategy, a Community Reference Group has been stood up to ensure that information is properly disseminated through the

community around the ARRC site, and that the community's views, concerns, and questions flow back to the ARRC team for proper actioning.

5.2.2 Consultation in the Context of an LGID

The Stakeholder Consultation Strategy supports the LGID proposal for the proposed development. The consultation strategy needs to provide for public consultation and consultation with all stakeholders. The Consultation Strategy must provide for the requirements in Chapter 8 Part 1 and Schedule 4 Section 8 of the Guidelines and state the period for consultation (typically a minimum of 20 business days). The extent of preliminary stakeholder engagement outside of the requirements of the Guidelines is up to the local government to decide.

The City will engage directly with property owners adjacent to the lots proposed for LGID prior to the mandated 20 business day public consultation period to notify of City's intent. Further to this, the general public in the area will be notified of the intent to designate the lots for infrastructure via signage on site and a dedicated webpage on the City's website.

5.3 Consultation Strategy (LGID)

5.3.1 Notification to Adjoining Properties

To inform those property owners bordering the proposed ARRC properties, a letter will be sent advising them of the need to develop the ARRC under an LGID to cater for the needs of the growing Gold Coast community and the process and implications of the LGID being made. A mail out of the letter will be undertaken 7 days prior to the 20-day notification period.

It should be noted that all adjacent property owners and the surrounding properties (within a 10 km radius of the ARRC) have been notified of the project on numerous occasions and a Community Reference Group has been established to ensure the community are kept informed and involved in the project. As such, the purpose of this letter will be to inform property owners with adjoining boundaries to the ARRC precincts of the LGID specifically. The following properties will be notified via letter of the LGID proposal:

- 6 Quinns Hill Road East (3RP110743)
- 54 Quinns Hill Road East (9RP184832)
- 76 Quinns Hill Road East (8RP184832)
- 90 Quinns Hill Road East (7SP299381)
- 59 Quarry Road (9RP110743)
- 159 Rossmanns Road (150W31134)
- 84 Christensen Road South (14SP342459)
- 7 Proximity Place (15SP342459)
- 15 Proximity Place (16SP342459)

-
- Lot 2 Rossmanns Road (2SP279441)
 - 231 Burnside Road (13RP134407)
 - 169 Burnside Road (10SP260804)
 - 155 Burnside Road (102SP260806)
 - 153 Burnside Road (8SP260821)
 - 18 Christensen Road South (7SP260820)

5.3.2 Signage and Public Notice

Signage will be posted at the entrances to the ARRC precincts as follows:

- Entrance to the northern precincts from Quarry Road (main gate)
- Entrance to the southern precincts on Christensen Road South (west gate)
- At the driveway/gate entrances on 8, 24, and 42 Quinns Hill Road East

Required material for the public notification period will be posted to Council's website on the ARRC web page for viewing and making submissions. Directions to access the webpage will be given on the signage and in the notice to identified stakeholders.

The Public Notification period will be 20 days. The required material for public viewing and submissions will be in accordance with the requirements of Schedule 4 Section 8 of the Minister's Guidelines.

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Appendix A – Master Plan of Designation Area

Figure 1.1 Site Location
(May 2025 Layout)



-  Project Area (95.1ha)
-  Disturbance Footprint - Infrastructure Components (70.29ha)
-  Avoidance Area (24.81ha)
-  Cadastre
-  Indicative design - WtE area
-  approximate layout
-  Watercourse
-  Roads
-  1. Material Recovery Facility
-  2. ARRC Innovation Park
-  3. Water Management
-  4. Hydrogen Refuelling & Research & Education Community Centre
-  5. Residual waste management area
-  6. Northern monocell
-  7. Residual WtE Platform
-  8. Roads
-  9. Southern monocell
-  10. Access track footprint
-  11. Easement (EPBC only)
-  12. Southern Waste Precinct
-  13. Existing Dam Wall
-  14. Light Vehicle Access Road
-  15. Utilities Connection Easement
-  16. Utilities Easement



Coordinate system: GDA2020 MGA Zone 56

Scale ratio correct when printed at A3

Date: 10/03/2005

Data sources: Queensland Australia, GLD-Biostat Cellulose

Mailmap, Mailmap VMS Services

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10-10-2001. G APPROVED FOR AND ON BEHALF OF WSP And

Working in the

Appendix B – State Endorsement

Our ref: DGBN26/70
LGID-0725-0959

Mr Tim Baker
Chief Executive Officer
City of Gold Coast Council
ceo@goldcoast.qld.gov.au


Dear Mr Baker

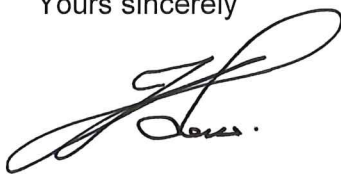
I write in response to a request dated 31 July 2025 from Dr Jemma Purandare, Chief Scientist at the City of Gold Coast Council, seeking a State interest review (SIR) of the proposed Local Government Infrastructure Designation (LGID) for the Advanced Resource Recovery Centre on land at Christensen Road, Rossmanns Road and Quinns Hill Road East, Stapylton.

An SIR has been undertaken on the proposed LGID and Environmental Assessment Report dated March 2026, in accordance with chapter 8, part 1, section 1.6 of the Minister's Guidelines and Rules.

In accordance with section 35(3) of the *Planning Act 2016*, the enclosed requirements must be included on the LGID.

If you require further information or assistance in relation to this matter, Mr Paul Beutel, Director, Development Assurance, Department of State Development, Infrastructure and Planning can be contacted on (07) 3452 7693 or by email at paul.beutel@dsdip.qld.gov.au.

Yours sincerely



John Sosso
Director-General

Enc

cc Dr Jemma Purandare
Chief Scientist
City of Gold Coast Council
jpurandare@arrcgoldcoast.com

Schedule 1: Notice of requirements included in the Local Government Infrastructure Designation (LGID) – Advanced Resource Recovery Centre

Development under the LGID is to be carried out in accordance with the plans, reports and documents referenced in the requirements included in **Table 1**.

Table 1 - Requirements	
Traffic impact assessment	
1.	<p>(a) Prior to the commencement of works for each precinct, prepare a new or updated Traffic Impact Assessment (TIA) certified by a Registered Professional Engineer of Queensland (RPEQ).</p> <p>(b) The new or updated TIA's must be prepared in accordance with the Department of Transport and Main Roads' (DTMR) <i>Guide to Traffic Impact Assessment 2017</i> (GTIA) and include/address:</p> <ul style="list-style-type: none"> i. revised traffic assessment and SIDRA intersection analysis based on: <ul style="list-style-type: none"> – the current day traffic counts under the GTIA methodology – traffic growth at the date of completion for each precinct component, including traffic scenarios with the addition of the proposed precinct component and background traffic – the cumulative impact of each previously completed precinct component – the cumulative impact any other significant approved developments located in the vicinity of the proposed development – all assumptions about trip rates, directionality and any discounts for existing use of the sites (which must be clearly identified and justified) ii. details of any impacts from the development on the safety, efficiency, and condition of local and State roads iii. a pavement impact assessment, (undertaken in accordance with TMR's GTIA and associated practice notes) where the cumulative development haulage exceeds 10,000 tonnes per annum iv. where assessment identifies mitigation is required, recommend measures to mitigate the impacts of the project on the safety, efficiency and condition of the state-controlled road networks. <p>(c) The TIA is to be finalised in consultation with DTMR.</p> <p>(d) Submit a copy of the TIA to the Department of State Development, Infrastructure and Planning (DSDIP) (infrastructuredesignation@dsdip.qld.gov.au) and DTMR (scr.calm@tmr.qld.gov.au) and include evidence of the consultation undertaken with DTMR and the incorporation of their feedback.</p> <p>(e) Liaise with DTMR to obtain the necessary approvals and undertake works for any necessary intersection/access's upgrades, other required works and impact mitigation strategies as detailed in the TIA.</p>

Stormwater management	
2.	<p>(a) Prior to the commencement of works, prepare a new or updated Stormwater Management Plan (SMP).</p> <p>(b) The new or updated SMP must be certified by an RPEQ and demonstrate:</p> <ul style="list-style-type: none"> i. a lawful point of discharge for internal site drainage ii. no material worsening to adjoining and downstream properties iii. staging of stormwater infrastructure delivery iv. procedures for implementing mitigation measures to prevent or minimise the release of contaminants to waters during construction v. a final stormwater infrastructure design that: vi. meets the requirements of Appendix 2 – Stormwater management, design objectives of the <i>State Planning Policy 2017</i> (SPP) vii. prevents or minimises the flow of stormwater containing contaminants, including hydrocarbons, from impacting on Matters of State Environmental Significance (MSES) viii. management actions and monitoring requirements in accordance with the <i>Queensland Wetland Buffer Guideline</i>. <p>(c) Submit a copy of the new or updated SMP to the DSDIP (infrastructuredesignation@dsdip.qld.gov.au).</p> <p>(d) Implement stormwater quantity and quality measures in accordance with the new or updated SMP.</p>
Flooding	
3.	<p>(a) Prior to the commencement of works, prepare a new or updated Flood Impact Assessment (FIA).</p> <p>(b) The new or updated FIA must be certified by an RPEQ and demonstrates:</p> <ul style="list-style-type: none"> i. confirmation of no adverse impacts on surrounding properties or infrastructure as a result of the proposed development ii. demonstration of compliance with relevant floodplain management requirements iii. integration with the proposed stormwater discharge and overland flow arrangements. <p>(c) Carry out the development in accordance with the recommendations of the new or updated FIA.</p>
Erosion and Sediment Control	
4.	<p>(a) Prior to the commencement of works, prepare an Erosion and Sediment Control Plan (ESCP) that addresses erosion risk and surface water run-off.</p> <p>(b) The ESCP is to be prepared by an appropriately qualified person and be in accordance with the Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association).</p> <p>(c) Submit a copy of the ESCP to DSDIP (infrastructuredesignation@dsdip.qld.gov.au) and the Department of Natural</p>

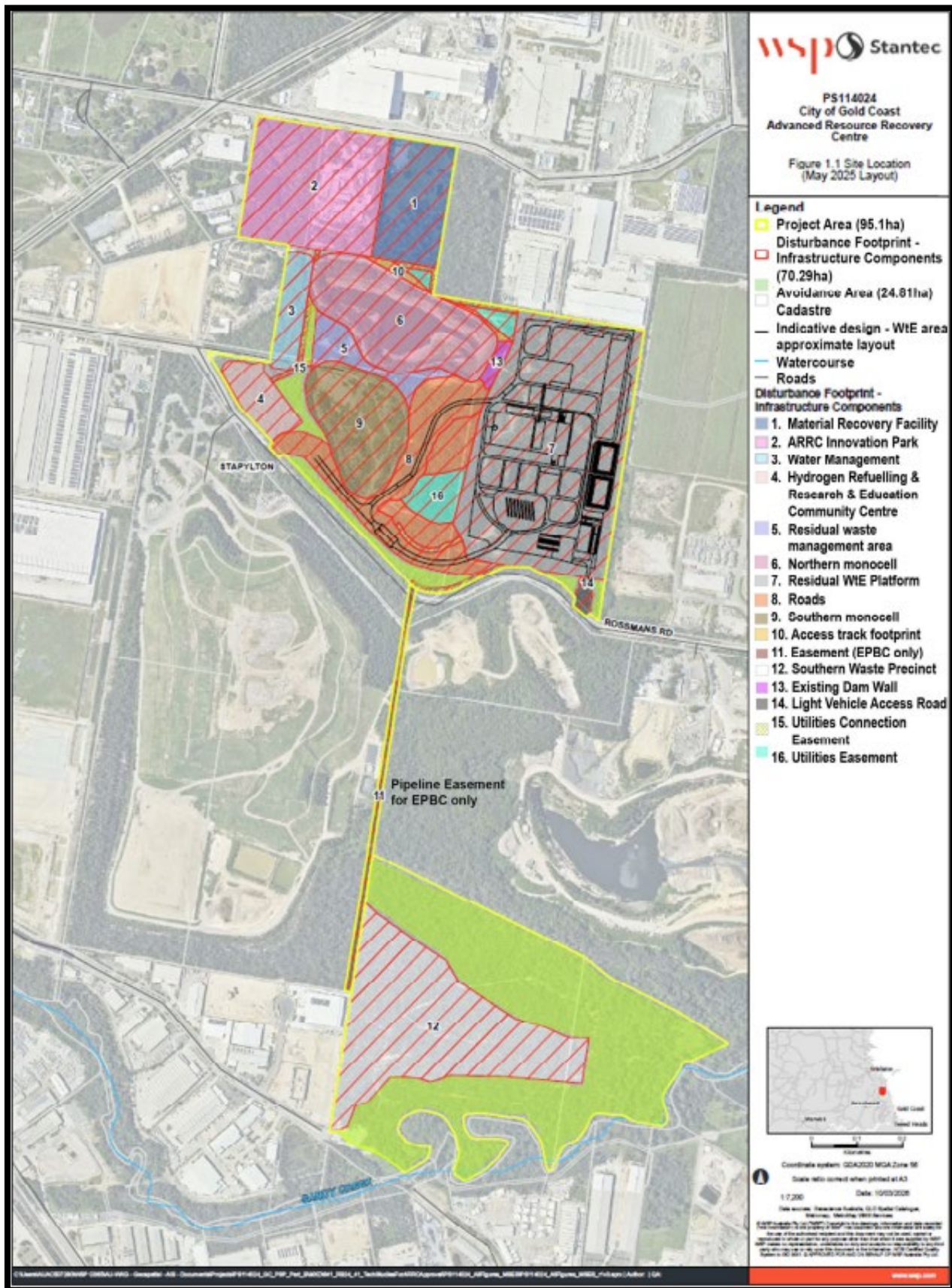
	<p>Resources and Mines, Manufacturing and Regional and Rural Development (dorplanning@resources.qld.gov.au).</p> <p>(d) Undertake works generally in accordance with the recommendations of the ESCP.</p>
Vegetation and fauna management	
5.	<p>With the exception of trees required to be cleared for bushfire management, weed/pest management, access or fencing, no clearing of non-juvenile koala habitat trees or habitat associated with mapped threatened ecological communities is to occur outside of the areas identified as 'Disturbance Footprint' on the <i>Figure 1.1: Site Location</i>, prepared by the WSP, dated May 2025, as included at Annexure 1.</p>
6.	<p>(a) Relocate any removed habitat features and resources (e.g. large woody debris, tree hollows, logs, rocks) required to be removed to facilitate the proposed development to adjacent areas.</p> <p>(b) Cleared vegetation must:</p> <ul style="list-style-type: none"> i. not be stacked or pushed against mature trees, habitat trees or tall immature trees that is not required to be cleared from construction impacts ii. not obstruct the flow of drains or watercourses.
7.	<p>(a) Prior to undertaking clearing works, prepare a Vegetation and Fauna Management Plan (VFMP).</p> <p>(b) The VFMP must be prepared by a suitably qualified person and:</p> <ul style="list-style-type: none"> i. include procedures to protect trees outside of the approved disturbance footprint not required to be removed to facilitate the works ii. identify adequate buffers to mapped MSES to avoid adverse impacts on vegetation, watercourses, wetlands and wildlife iii. identify all threats to the identified MSES through direct and in-direct disturbance, ecological degradation processes, edge-effects, erosion or contamination from stormwater run-off, and environmental weeds iv. identify appropriate mitigation measures to reduce the likelihood of impacts to MSES and wildlife species during construction, that must include: <ul style="list-style-type: none"> – procedures for pre-clearing surveys for the identification of fauna species that may be impacted and fauna breeding sites – procedures that specify the required actions in the event that fauna breeding sites are identified or fauna is adversely impacted or injured by clearing activities – requirements that site activities must be carried out only during daylight hours – requirements that an appropriately trained fauna spotter/catcher be present during all vegetation clearing, habitat removal, excavation works and other activities identified to potentially impact fauna – an appropriate site speed limit that applies to all vehicle movement

	<ul style="list-style-type: none"> - a requirement that vehicles and machinery must not traverse outside of the approved development footprint - procedures for biosecurity control measures required to prevent the spread of invasive plant species within the development area and to identified MSES, watercourses and wetlands - requirements that all vehicles and machinery must be cleaned down prior to entry to the site in accordance with the <i>Department of Agriculture and Fisheries Queensland Vehicle and Machinery Checklists Clean-down Procedures 2014</i> - a requirement for all personnel onsite to undergo site inductions in which personnel are made aware of their obligations and responsibilities under the VFMP <p>v. outline mitigation measures and management actions required for the protection of MSES regulation vegetation from direct and indirect impacts from the ongoing operation of the activity</p> <p>vi. identify biosecurity control measures and post development management actions required to prevent the spread of invasive plant species within the development area and to identified MSES, watercourses and wetlands</p> <p>vii. identify landscaping design and the choice of vegetation species for use in landscaping that enhance or protect MSES and avoid impacts on MSES through the inappropriate planting of native or exotic invasive species.</p> <p>(c) Submit a copy of the VFMP to DSDIP (infrastructuredesignation@dsdip.qld.gov.au) and the Department of Environment, Tourism Science and Innovation (sara@des.qld.gov.au)</p> <p>(d) Undertake works generally in accordance with the recommendations of the VFMP.</p>
Rehabilitation monitoring plan	
8.	<p>(a) Prior to undertaking clearing works, prepare a Rehabilitation Monitoring Plan (RMP) for the assessment and progressive rehabilitation of disturbed areas.</p> <p>(b) The RMP must be prepared by a person suitably qualified in site rehabilitation and include/address:</p> <ul style="list-style-type: none"> i. all areas of temporary disturbance to be progressively rehabilitated following construction ii. soil stabilisation, direct seeding, managing natural regeneration and weeds iii. re-use of hollow-bearing stags, woody debris, logs and rocks iv. measures to ensure the restoration and reconnection of habitats v. measures to ensure bank stability and water quality as a result of clearing within watercourse or drainage features vi. monitoring, auditing and reporting objectives undertaken annually for the first five years, to monitor native vegetation regeneration progress, presence of weeds or other disturbance.

	<p>(c) Submit a copy of the RMP to DSDIP (infrastructuredesignation@dsdip.qld.gov.au)</p> <p>(d) Following completion of works, undertake the rehabilitation of the disturbed areas generally in accordance with the RMP.</p>
Bushfire management	
9.	<p>(a) Prior to the commencement of use, prepare a bushfire hazard assessment and management plan (BMP).</p> <p>(b) The BMP must be prepared in accordance with <i>Bushfire Resilient Communities</i> (Queensland Fire and Emergency Services (QFES), 2019) by a person suitably qualified in bushfire management and include/address:</p> <ul style="list-style-type: none"> i. relevant Australian Standards (AS) including <i>AS3959–2009 - Construction of Buildings in Bushfire Prone Areas</i> and <i>AS1940–2004 - The Storage and Handling of Flammable and Combustible Liquids</i> ii. off-site matters such as access and egress and vegetation hazard mitigation iii. procedures for checking fire hazard warnings and response to emergency and fire situations iv. site set out measures including location of firefighting equipment, designated smoking areas and cigarette bins v. maintenance of firefighting equipment and training of personnel in the use of firefighting equipment vi. vegetation clearing for fire protection including a maintenance schedule and management of cleared vegetation. <p>(c) Submit a copy of the BMP to DSDIP (infrastructuredesignation@dsdip.qld.gov.au) and Queensland Fire Department (QFD) (brc@fire.qld.gov.au)</p> <p>(d) Prior to the commencement of use for each stage of the development, implement the mitigation measures and recommendations of the BMP.</p> <p>(e) As new development is introduced on the site, update the BMP and submit a copy to DSDIP and QFD (brc@fire.qld.gov.au).</p>
10.	<p>(a) Prior to the commencement of the use, prepare a bushfire emergency and evacuation procedure (BEEP).</p> <p>(b) The BEEP must be prepared by a suitably qualified person and address the following:</p> <ul style="list-style-type: none"> i. the Australian Fire Danger Rating System ii. emergency procedures including the designation of buildings capable of being securely sealed for customer and staff refuge during bushfire events and mapped evacuation routes and emergency assembly point(s) iii. emergency team roles and responsibilities including contact details iv. location of emergency equipment for use by staff intending to defend the premises v. evacuation drill schedule vi. a process whereby all staff are made aware of the BEEP.

	<p>(c) A copy of the BEEP must be submitted to DSDIP (infrastructuredesignation@dsdip.qld.gov.au and QFD (brc@fire.qld.gov.au).</p> <p>(d) Implement the recommendations of the BEEP.</p> <p>(e) As new development is introduced on the site, update the BEEP and submit a copy to DSDIP and QFD.</p>
11.	Prior to the commencement of use, design and construct access roads to allow safe evacuation and access by emergency services appliances in accordance with the <i>Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots</i> (QFES, 2019).
Contaminated land management	
12.	<p>(a) Following demolition of existing buildings, prepare a contaminated land investigation report (CLIR).</p> <p>(b) The CLIR must be prepared by a suitably qualified person and include/address the extent of additional testing required to inform the remediation and/or site management approaches in order to achieve compliance with the <i>Environmental Protection Act 1994</i>.</p> <p>(c) Submit a copy of the CLIR to DSDIP (infrastructuredesignation@dsdip.qld.gov.au).</p> <p>(d) Carry out the development in accordance with the recommendations of the CLIR.</p>
Hazardous chemicals	
13.	Any chemicals stored or used must not exceed 10 per cent of the chemical's threshold quantity under the Work Health and Safety Regulation, Schedule 15.
Acid sulfate soils	
14.	If potential or actual acid sulfate soil (ASS) is identified during construction, an ASS investigation is to be carried out in accordance with an ASS management plan prepared in accordance with the current Queensland <i>ASS Technical Manual - Soil Management Guidelines</i> .

Annexure 1 – Site location plan



FOR MORE INFORMATION

P 1300 GOLDCOAST (1300 465
326)
W cityofgoldcoast.com.au