

Mamre Road Data Centre Campus

706 – 752 Mamre Road, Kemps Creek

GHG Assessment Report

Project No.	P02638
Revision	06
Issued	4 December 2025
Client	Plan Project Management Pty Ltd



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Issue And Revision Record

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04	28.11.2025	Minor Update	TB / ZM	AK
05	01.12.2025	Program Update	TB / ZM	AK
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Simulations and calculations provides an estimate of performance and emissions. This estimate is based on simplifications that do not and cannot fully represent the intricacies of performance and emissions once in operation. As a result, these estimations only represent an interpretation of potential emissions based on the information and details provided. This preliminary study in no way confirms the estimated performance or emissions. No guarantee or warrantee of emissions in practice can be based on the estimate results alone.

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Alex Kobler | Director

E-LAB Consulting

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We recognise the Traditional Custodians of the land on which the proposed development will be constructed. We respect their enduring cultural and spiritual connections to the land and waters, and celebrate their knowledge, kinship, and values. We acknowledge that these connections to the land and waters have existed for millennia and will continue into the future. We respect the Elders who have gone before, together with those of today for their guidance on our shared journey. We recognise that we are, and always will be, on Aboriginal land.

Abbreviations

Table 1: Abbreviations

Term	Definition
Greenhouse Gas Emissions	The release of gases, such as carbon dioxide (CO ₂), methane (CH ₄), and nitrous oxide (N ₂ O), into the atmosphere that have the potential to enhance the greenhouse effect and contribute to global warming and climate change.
Carbon Dioxide Equivalent (CO ₂ -e)	A standard unit for measuring carbon footprints, expressing the impact of different GHGs in terms of the equivalent amount of CO ₂ that would cause the same warming effect.
Carbon Offset	A compensatory measure in which an organisation or individual invests in activities or projects that reduce or remove an equivalent amount of greenhouse gas emissions from the atmosphere to offset their own emissions, helping achieve carbon neutrality.
Emission scopes	Categories used to classify sources of GHG emissions: Scope 1 (direct), Scope 2 (indirect from purchased energy), and Scope 3 (other indirect sources, such as supply chain and waste).
Scope 1 GHG Emissions	Direct emissions from sources owned or controlled by the project (e.g. diesel combustion, refrigerant fugitive emissions).
Scope 2 GHG Emissions	Indirect emissions from the generation of purchased electricity consumed by the project (e.g. grid electricity for data centre operations).
Scope 3 GHG Emissions	Other indirect emissions that occur as a consequence of the project's activities but are from sources not owned or controlled by the project (e.g. embodied carbon in materials, transport, waste)

Independent Expert Review

This Greenhouse Gas (GHG) Emissions Assessment has been reviewed by an Independent Expert Reviewer as required by the NSW Guide to Large Emitters. The following identifies the details of the review:

Table 2: Independent Expert Review Details

Item	Detail
Reviewer	Marlon Kobacker – Principal, MSK Sustainability Consulting
Role	Independent Expert Reviewer – GHG Assessment
Qualifications	M.BuiltEnv (Sustainable Development), B.Photovoltaic Eng, Climate Active Consultant, ISO 9001 Lead Auditor
Experience	20+ years in GHG quantification, verification, and decarbonisation strategy
Independence	Independent of proponent and consultant team; no conflicts of interest
Date of Review	02 December 2025
Outcome	GHG Assessment deemed technically sound and generally compliant with the NSW Guide for Large Emitters; recommended for acceptance for planning approval



SEARs

The proposed Mamre Road Data Centre Campus project located at 706–752 Mamre Road, Kemps Creek, NSW 2178 is required to submit a State Significant Development Application (SSD-92743706). As such the Secretary's Environmental Assessment Requirements (SEARs) is applicable. To provide context to this particular assessment and report, refer to the SEARs responses below which is to be read in conjunction with the project specific Ecologically Sustainable Design (ESD) report.

Table 3: SEARs Response Table

SEARs Compliance

Section	Request Item	Summary Response	Section Reference
Ecologically Sustainable Development	Identification of how ESD principles (as defined in section 193 of the EP&A Regulation) are incorporated in the design, construction and ongoing operation of the development	The project incorporates the ESD principles through a variety of initiatives and strategies. Through reduction of energy, water and material consumption and reducing production of waste, the project is able to reduce damage, preserve the environment and ensure resources for future generations.	This report summarises the general mitigation measures in place to reduce GHG emissions. For further detail regarding energy, water and material consumption refer to ELAB_706-752 Mamre Rd_ESD Report_005 dated 4 December 2025.
	Demonstration of how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards, including a maximum Power Usage Effectiveness (PUE) of 1.3 and a minimum NABERS rating of five stars	<p>Introduction of a variety of energy reducing strategies for alignment with best-in-class PUE including efficient services with effective operational controls, efficient cooling towers and chillers, regular review of operating strategies and appropriate equipment selection. Additionally, liquid cooling strategies will be piloted.</p> <p>Aim for full electrification of site and projected goal to purchase 100% of electricity from renewable energy along with customer procurement (green tariffs and RECs) by 2030. To be achieved through power purchase agreements (PPAs) and virtual PPAs.</p>	<p>This report summarises the energy consumption and subsequent GHG emissions associated with the project. Additional details regarding mitigation measures are described.</p> <p>For further detail regarding energy, PUE and NABERS refer to ELAB_706-752 Mamre Rd_ESD Report_005 dated 4 December 2025.</p>
	Identification of the projected Water Usage Effectiveness (WUE) for the development, compared against recognised 'best practice' benchmarks	Client portfolio WUE has been identified and will be used as the target for the project. WUE has been preliminary estimated to be 0.1 L/kWh. This will be aimed to be achieved through minimising water consumption through effective design, fixtures and water reuse including rainwater harvesting for mechanical systems.	Refer to ELAB_706-752 Mamre Rd_ESD Report_005 dated 4 December 2025.
	Demonstration of how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources	Initiatives in place for energy reduction, aim for 5 Star NABERS energy and PUE of 1.3 at 100% utilisation coupled with tenant collaboration which reduce GHG emissions. Aim for Net Zero emissions for Scope 1 and Scope 2 by 2030, through decarbonisation strategies which include piloting renewable diesel, procuring renewable energy on behalf of	<p>This report summarises the energy consumption and subsequent GHG emissions associated with the project. Additional details regarding mitigation measures are described.</p> <p>For further detail regarding energy, water and material resources consumption refer</p>

SEARs Compliance

Section	Request Item	Summary Response	Section Reference
		customers and partnering with renewable contracts/offsets.	to ELAB_706-752 Mamre Rd_ESD Report_005 dated 4 December 2025.
	<p>if Chapter 3 of State Environmental Planning Policy (Sustainable Buildings) 2022 applies, include:</p> <ul style="list-style-type: none"> - demonstration as to how the development has been designed to address the provisions set out in in Chapter 3.2(1) - a NABERS Embodied Emissions Material Form to disclose the amount of embodied emissions attributable to the development in accordance with section 35BA of the EP&A Regulation 	<p>Targets for NABERS energy and water rating are superseded by the SEARs specific requirements.</p> <p>NABERS embodied emissions material form is to be completed by quantity surveyor, however, strategies are in place to incorporate circular economy principles wherever possible at each stage of the lifecycle, aiming to reduce raw material usage, promote reuse, and improve diversion rates.</p>	Refer to NABERS Embodied Emissions Form provided by Linesight. This is provided separately from the ESD report.



Executive Summary

E-LAB Consulting have been engaged by Plan Project Management Pty Ltd in care of their Client as the Ecologically Sustainable Design (ESD) consultant for the proposed Mamre Road Data Centre Campus Project located at 706–752 Mamre Road, Kemps Creek, NSW 2178. E-LAB Consulting have prepared the following Greenhouse Gas (GHG) Assessment to supplement the Environmental Impact Assessment (EIS) forming part of the State Significant Development Application (SSD-92743706) as dictated by various sustainability and legislative frameworks.

The site is proposed for development under a State Significant Development Application (SSDA) as a data centre campus comprising:

- Approximately 26 shells across four-storeys data centre buildings (4x four shells and 2x five shells), including six technical office buildings, plus a campus office.
- Incoming and internal electrical substations and associated infrastructure
- Site preparation, including earthworks, stormwater, sewer, roads, and associated infrastructure.

While the masterplan is staged, the intention is to submit a single SSDA report covering the full development scope.

As part of the NSW Environmental Planning and Assessment (EPA) Regulation 2021, if a project is likely to emit 25,000 tonnes or more as part of Scope 1 and 2 for any financial year during operations, the NSW Guide for Large Emitters is required which in turn requires the GHG Assessment.

The assessment boundary for greenhouse gas (GHG) emissions considers all operational activities across the campus. Emissions sources include direct (Scope 1) emissions from on-site fuel use, indirect (Scope 2) emissions from purchased electricity, and particular indirect (Scope 3) emissions from supply chains, waste, and employee travel.

The GHG emissions assessment has been undertaken in alignment with national reporting frameworks including the NGER (Measurement) Determination 2008 and the IPCC 2006 Guidelines for National Greenhouse Gas Inventories. The results, summarised below, provide expected peak annual emissions estimates across both maximum capacity and planned operational throughput when all stages of the campus are online and operational:

Table 4: Peak Scope 1, 2 and 3 Emissions

Stage	Year	Scope 1 (t CO ₂ - e/year)	Scope 2 (t CO ₂ - e/year)	Total Scope 1+2 (t CO ₂ - e/year)	Operational Scope 3 (t CO ₂ -e/year)	Illustrative Construction Scope 3 (t CO ₂ -e/year)	Total Scope 1, 2 and 3 (t CO ₂ - e/year)
Operations – Maximum capacity	2032	998.8	1,699,710	1,700,709	307,998	23,288	2,031,994
Operation – Planned throughput	2032	998.8	1,296,029	1,297,028	235,133	23,288	1,555,449

*The above table identifies emissions when peak. This is based on utilisation and staging of the project, and does not represent when all phases are online.

Key mitigation measures have been identified to reduce the project’s carbon footprint. These include optimisation of building design for energy efficiency, integration of renewable energy supply, reduction of embodied carbon in construction materials, and the use of high-efficiency cooling and power distribution systems.

The Mamre Road Data Centre Campus project is committed to setting and achieving emission reduction goals, supported by a framework of continuous improvement reviewed at a minimum of five-year intervals. This approach ensures the project aligns with the transition to a low-carbon economy while maintaining operational resilience. The project will also comply with all applicable Safeguard Mechanism and National Greenhouse and Energy Reporting (NGER) obligations, ensuring transparency, accountability, and alignment with Australia’s national climate policies.

1 Introduction

1.1 Purpose

This GHG Assessment has been prepared to support the EIS as part of the submission for the State Significant Development Application (SSD-92743706) for the Mamre Road Data Centre Campus project, located at 706–752 Mamre Road, Kemps Creek, NSW 2178. The purpose of this report is to evaluate the project’s greenhouse gas emissions profile, outline mitigation measures, and demonstrate alignment with the requirements of the NSW Guide for Large Emitters and the Climate Change (Net Zero Future) Act 2023 as triggered by the requirements of the EPA 2021.

The assessment also ensures compliance with applicable sustainability and planning frameworks, including the State Environmental Planning Policy 2022 (SEPP), the Protection of the Environment Operations Act 1997, and the National Greenhouse and Energy Reporting (NGER) Scheme.

In line with the NSW Guide for Large Emitters, this report will:

- Describe the project.
- Specify the assessment boundary and major sources of emissions.
- Provide emissions estimates across Scopes 1, 2 and 3.
- Identify the IPCC sectors and subsectors relevant to the project’s emissions profile;
- Outline mitigation strategies and long-term emission reduction commitments; and
- Demonstrate compliance with statutory reporting obligations and sustainability initiatives.

1.2 Project Description

The Mamre Road Data Centre Campus development is a data centre project part of a larger series of data centre projects around Sydney, NSW. The development is located at 706 – 752 Mamre Road, Kemps Creek NSW 2178 within the industrial precinct of the suburb. The site is proposed for development under a State Significant Development Application (SSDA) as a data centre campus comprising:

- Approximately 26 shells across four-storeys data centre buildings (4x four shells and 2x five shells), including six technical office buildings, plus a campus office.
- Incoming and internal electrical substations and associated infrastructure
- Site preparation, including earthworks, stormwater, sewer, roads, and associated infrastructure.

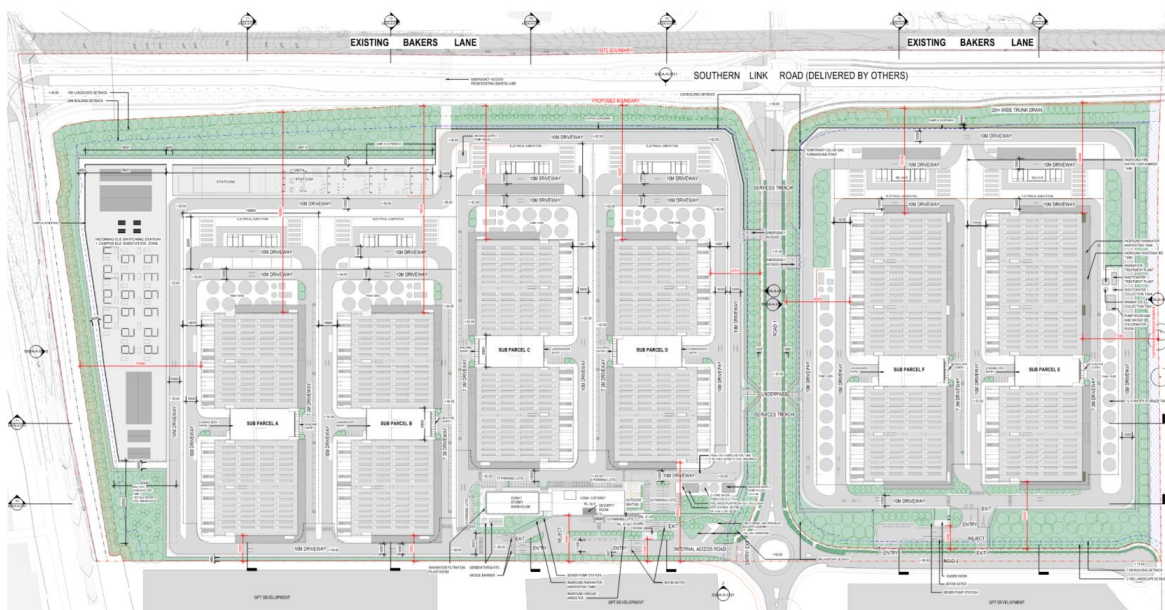


Figure 1: Project Overview (source: Greenbox Architecture)

1.3 Project Location

The project area for the proposed development, 706-752 Mamre Road, Kemps Creek (Lot 10 DP 1280592), constitutes the main development site with areas across the shared boundaries to the east and south (described below) utilised to facilitate roadworks and bulk earthworks:

- Gibb Group site to the East known as 1-22 Bakers Lane, Kemps Creek (Lot 40 in DP 709347).
- GPT Group site to the South known as 754 Mamre Road, Kemps Creek (Lot 180 in DP 1290397).

Additionally, power supply lead-in from Sydney-West Substation is proposed as part of the development, which traverses through multiple landholdings

Surrounding land use is a mix of rural, agricultural, and emerging industrial activity, supported by infrastructure upgrades such as the Mamre Road widening. The site is located approximately 39 kilometres west of the Sydney CBD.



Figure 2: Site Location (source: Nearmap)

1.4 NSW Guide to Large Emitters

In line with the NSW EPA and NSW legislation, policies and initiatives in aiming for Net Zero, the EPA and other agencies have developed the NSW Guide for Large Emitters. The guide's main objective is reducing emissions through informing GHG aspects of the development and consideration/assessment of the development proposal. This additionally includes the development of the GHG assessment which forms part of the EIS for 'large emitters'.

This is to ensure projects with significant GHG emissions are properly assessed as part of the development application. The guide responds to the NSW Climate Change (Net Zero Future) Act 2023 which legislates emission reduction targets. The outcome of this guide is to show how developments are avoiding, reducing, substituting and managing emissions through project design, operations and offsets where possible.

As Mamre Road Data Centre Campus is expected to be a 'larger emitter' due to the project typology, the GHG assessment will form a mandatory part of the EIS which is to be submitted for the SSDA.

The NSW Guide for Large Emitters is required, only if all three criteria are met as outlined in the guide. This criterion includes:

- 1) Planning Requirement: The project requires development approval, or a modification of approval
- 2) EPA License: The project involves scheduled activity under the Protection of the Environment Operations Act 1997 and/or will be carried out at an existing EPA licensed premises
- 3) Emissions Threshold: The project is likely to emit 25,000 tonnes CO₂-e or more as part of Scope 1 and 2 for any financial year during operations

1.5 Classification of Project Emissions

The project is classified as a large emitter under the NSW Guide due to the following triggers:

1. Planning requirement – the project requires approval under the SSDA framework;
2. EPA licensing – the development involves scheduled activities requiring an EPA licence under the Protection of the Environment Operations Act 1997; and
3. Emissions threshold – projected annual Scope 1 and 2 emissions are expected exceed the 25,000 t CO₂-e/year threshold.

Accordingly, a comprehensive GHG assessment is mandatory and forms part of the EIS.

1.6 IPCC Sectors and Sub-sectors

Project-related emissions are categorised in accordance with the Intergovernmental Panel on Climate Change (IPCC) guidelines and include:

- Energy – Stationary Combustion (diesel back-up generators and construction fuel use).
- Energy – Electricity Generation and Consumption (grid-purchased electricity for operations)
- Industrial Processes and Product Use (IPPU) (emissions from construction materials and refrigerants)
- Waste (construction waste, demolition materials, and operational waste streams)

1.7 Project Staging and Timeframes

The Mamre Road Data Centre Campus is to be delivered in multiple phases under a consolidated SSDA submission. The key estimated stages are as follows:

- Construction Stage – covering site preparation, earthworks, and building construction over approximately 10 years. The construction program has been staged in multiple 'phases' with the first phase to begin in 2026 with continual work as new phases come online.
- Operational Stage – each shell is to come into operation after construction is complete. Shells will come online after construction even if other shells in the phase are incomplete. Operations are expected to begin in 2028 with full campus operation in 2036 with projections up to 2080.
- Decommissioning and Closure Stage – retirement of data centre infrastructure and equipment after has not been estimated.

It should be noted that the above stages are estimated and indicative at concept development. While these inform the GHG assessment, it is subject to further changes during construction and tenant utilisation.

Each stage has been considered within the GHG emissions assessment to ensure a whole-of-life emissions profile is captured. It is noted that the total program for construction is estimated to be 10 years. Therefore, based on these estimates and assumptions, the entire data campus will be in full operation in 2036. The following table summarises the projected staging plan and overview that has informed the assessment:

Table 5: Staging Plan

Stage	Phase	Subparcel	Building Number	Name	Operational from (Year)	Building type
Stage 1	Phase 1	NA	0	Stage 1 Phase 1 Building 0	2028	Ops Hub (warehouse + office)
Stage 1	Phase 1	A	1	Stage 1 Phase 1 #1	2028	Data centre
Stage 1	Phase 1	A	2	Stage 1 Phase 1 #2	2028	Data centre
Stage 1	Phase 1	A	3	Stage 1 Phase 1 #3	2028	Data centre
Stage 1	Phase 1	A	4	Stage 1 Phase 1 #4	2028	Data centre



Stage 1	Phase 2	B	1	Stage 1 Phase 2 #1	2030	Data centre
Stage 1	Phase 2	B	2	Stage 1 Phase 2 #2	2030	Data centre
Stage 1	Phase 2	B	3	Stage 1 Phase 2 #3	2030	Data centre
Stage 1	Phase 2	B	4	Stage 1 Phase 2 #4	2030	Data centre
Stage 1	Phase 3	C	1	Stage 1 Phase 3 #1	2031	Data centre
Stage 1	Phase 3	C	2	Stage 1 Phase 3 #2	2031	Data centre
Stage 1	Phase 3	C	3	Stage 1 Phase 3 #3	2031	Data centre
Stage 1	Phase 3	C	4	Stage 1 Phase 3 #4	2031	Data centre
Stage 1	Phase 4	D	1	Stage 1 Phase 4 #1	2032	Data centre
Stage 1	Phase 4	D	2	Stage 1 Phase 4 #2	2032	Data centre
Stage 1	Phase 4	D	3	Stage 1 Phase 4 #3	2032	Data centre
Stage 1	Phase 4	D	4	Stage 1 Phase 4 #4	2032	Data centre
Stage 2	Phase 5	E	1	Stage 2 Phase 5 #1	2035	Data centre
Stage 2	Phase 5	E	2	Stage 2 Phase 5 #2	2035	Data centre
Stage 2	Phase 5	E	3	Stage 2 Phase 5 #3	2035	Data centre
Stage 2	Phase 5	E	4	Stage 2 Phase 5 #4	2035	Data centre
Stage 2	Phase 5	E	5	Stage 2 Phase 5 #5	2035	Data centre
Stage 2	Phase 6	F	1	Stage 2 Phase 6 #1	2036	Data centre
Stage 2	Phase 6	F	2	Stage 2 Phase 6 #2	2036	Data centre
Stage 2	Phase 6	F	3	Stage 2 Phase 6 #3	2036	Data centre
Stage 2	Phase 6	F	4	Stage 2 Phase 6 #4	2036	Data centre
Stage 2	Phase 6	F	5	Stage 2 Phase 6 #5	2036	Data centre

2 Legislative and Policy Context

The Mamre Road Data Centre Campus is being delivered within a robust legislative and policy framework that governs greenhouse gas (GHG) emissions assessment, mitigation, and reporting in New South Wales and across Australia. This framework establishes both statutory obligations and strategic commitments to support the transition to a low-carbon economy, and underpins the methodology adopted for this assessment. For additional sustainability frameworks and policy context, refer to the ESD report for detail.

2.1 Climate Change (Net Zero Future) Act 2023

The Climate Change (Net Zero Future) Act 2023 sets the legislative foundation for New South Wales to achieve net zero emissions by 2050, with interim reduction targets of 50% below 2005 levels by 2030. The Act requires new large-scale developments to demonstrate how emissions will be avoided, reduced, substituted, and managed across the project lifecycle. This assessment aligns with the objectives of the Act by identifying emissions across Scopes 1, 2 and 3, and outlining mitigation strategies consistent with the State's decarbonisation pathway.

2.2 Net Zero Plan Stage 1: 2020–2030

The NSW Net Zero Plan Stage 1: 2020–2030 provides the State's roadmap for reducing emissions over the next decade. The plan highlights energy efficiency, renewable electricity, and electrification of infrastructure as central strategies.

2.3 Protection of the Environment Administration Act 1991

This Act establishes the NSW Environment Protection Authority (EPA) and provides the framework for environmental protection and pollution control. For the Mamre Road Data Centre Campus, the Act underpins the EPA's authority to regulate emissions, monitor compliance, and require reporting.

2.4 Protection of the Environment Operations Act 1997 (POEO Act)

The POEO Act is the primary legislation regulating air, water, and noise pollution in NSW, and requires developments such as data centres to obtain the relevant EPA licences. As a large-scale, high-capacity facility, Mamre Road Data Centre Campus will be licensed under the POEO Act, and its emissions managed in accordance with best practice standards for air quality and pollution control.

2.5 National Greenhouse and Energy Reporting (NGER) Scheme

Under the NGER Act 2007, facilities that exceed certain energy use or emissions thresholds must report annually to the Clean Energy Regulator. Based on projected operational emissions, the Mamre Road Data Centre Campus is expected to meet the reporting threshold and will therefore be subject to NGER obligations, requiring transparent annual disclosure of its Scope 1 and 2 emissions.

2.6 Safeguard Mechanism

In addition to NGER, the Safeguard Mechanism applies to facilities emitting more than 100,000 t CO₂-e per year for Scope 1 emissions. Given the energy-intensive nature of data centres, it is anticipated that Mamre Road Data Centre Campus will not trigger this threshold and will therefore not be required to operate within facility-specific emissions baselines, as set by the Clean Energy Regulator. Compliance with the Safeguard Mechanism may require a combination of on-site abatement measures, renewable energy procurement, and the use of eligible carbon offsets.



2.7 Other Relevant Policies and Frameworks

The development is also guided by other frameworks:

- State Environmental Planning Policy (SEPP), Sustainable Buildings, 2022
- Secretary's Environmental Assessment Requirements (SEARs)
- Mamre Road Precinct Development Control Plan (DCP), 2021
- ABCB National Construction Code (NCC) 2022 Volume 1, Section J
- NABERS Energy

Additional detail regarding the responses and the strategies in place for the above frameworks are described in ELAB_706-752 Mamre Rd_ESD Report_005 dated 4 December 2025.

3 GHG emissions assessment

3.1 Assessment Boundary

The GHG assessment boundary for the Mamre Road Data Centre Campus has been defined in accordance with the NGER (Measurement) Determination 2008 and the IPCC 2006 Guidelines for National Greenhouse Gas Inventories. As identified by the NSW Guide for Large Emitters, scope 1, scope 2 and particular scope 3 emissions have been included while the non-mandatory scope 3 emissions are to be excluded.

Included Sources:

Scope 1 – Direct emissions

- On-site fuel combustion: Emissions from diesel or natural gas used in back-up generators, boilers, or other on-site equipment. These are direct, controllable emissions from fuel consumed on-site.
- Refrigerants and other process gases (if applicable): Any direct leakage of refrigerants or other greenhouse gases from building systems that are under operational control.

Scope 2 – Indirect emissions from purchased energy

- Electricity consumption: Emissions from purchased electricity used in building operations, including:
 - HVAC systems
 - Lighting (internal and external)
 - IT equipment and server loads
 - Ancillary building services (elevators, pumps, ventilation)

Scope 3 – Related and relevant emissions

- Fuel and energy related activities: Upstream emissions from electricity generation and transmission/distribution (T&D) losses. Major contributor due to high electricity demand.
- Purchased goods and services: Embodied emissions from IT equipment, UPS systems, switchgear, racks, etc. For a data centre, this is a key source given frequent equipment refresh cycles.
- Capital goods: Covers embodied emissions of major long-life infrastructure such as chillers, transformers, generators, and building systems.
- Upstream transportation and distribution: Emissions from logistics and transport of large electrical and IT equipment from suppliers/manufacturers to site.
- Waste generated in operations: Includes e-waste, battery disposal, packaging, and general operational waste.
- Business travel: Accounts for travel by staff or contractors for operational and management purposes
- Employee commuting: Includes staff and contractor travel to the site

Scope 3 – Indirect upstream and downstream emissions (Illustrative – included as a simple estimation of predicted construction Scope 3 emissions)

Upstream / Construction-Related

- Construction activities: Emissions from material transport and construction/demolition waste.
- Embodied carbon in materials: Emissions associated with production and transport of major construction materials such as concrete and steel.



Excluded Sources:

Scope 3 – Indirect upstream and downstream emissions

Upstream / Construction-Related

- Construction activities: Emissions from land clearing, excavation, on-site machinery fuel use, and other construction operations.
- Capital goods for site establishment: Temporary plant, offices, and civil works embodied emissions excluded as these are one-off and reported separately in construction-phase assessments.

Downstream / Operational-Related but Indirect

- Downstream electricity and product use: Use-phase emissions from tenants' IT workloads and customer digital services fall outside the operator's reporting boundary.
- Downstream transport and distribution: No physical goods or materials are distributed downstream as part of normal operations.
- Processing or end-of-life treatment of sold products: Not applicable as the data centre provides digital infrastructure, not tangible products.
- Downstream leased assets: Client IT capacity is leased virtually, not as physical assets; emissions are accounted for by customers under their own Scope 2 or 3 inventories.
- Franchises and investments: No franchise operations or investment portfolios are associated with the project.

Other minor sources

- Operations hub offices: Considered negligible as energy consumption compared to entire campus is relatively small.
- Small-scale tenant fit-outs: Considered separately as part of tenant-managed emissions.
- Post-closure landscaping maintenance: Small-scale maintenance emissions assumed negligible relative to operational energy.

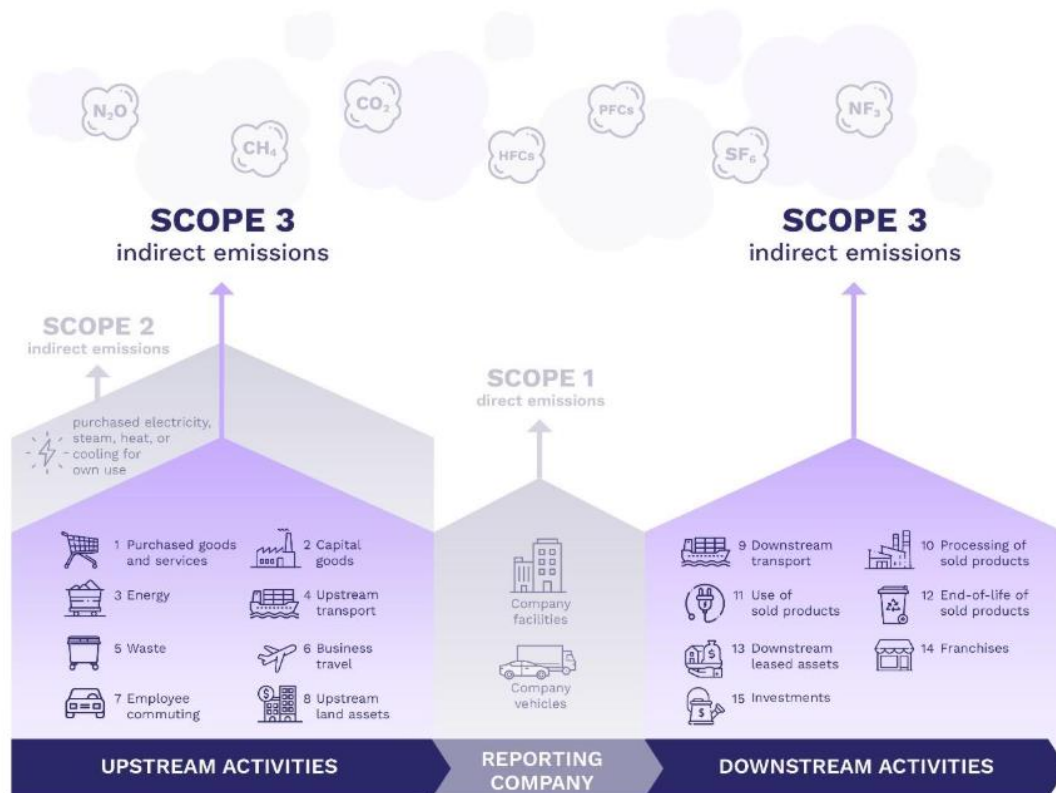


Figure 3: Representation of the Emissions Boundary and Sources

3.2 Emissions Scenarios

For new developments such as Mamre Road Data Centre Campus, the 'project-only' scenario has been assessed. This represents the expected GHG emissions profile for the operation of the facility under the proposed SSDA.

As Mamre Road Data Centre Campus is a new development (not a modification), 'business-as-usual' or 'modified-business' scenarios are not applicable. Instead, scenario modelling has been applied to reflect:

- Maximum capacity operations (full IT load and energy demand).
- Planned operational throughput (anticipated average annual load profile).

3.3 Emissions Sources

The typical emissions sources within the assessment boundary are categorised as follows:

- Scope 1 – Direct emissions:
 - Diesel combustion from construction equipment and back-up generators.
 - Fugitive refrigerant emissions.
- Scope 2 – Indirect emissions:
 - Purchased electricity from the grid during operations.
- Scope 3 – Related and relevant emissions:
 - Fuel and energy related activities.
 - Purchased goods and services.
 - Capital goods.
 - Upstream transportation and distribution.
 - Waste generated in operations.
 - Business travel.
 - Employee commuting.
- Scope 3 – Indirect upstream and downstream emissions (Illustrative)
 - Illustrative Construction Waste
 - Illustrative Construction Transport
 - Illustrative Embodied Materials (Concrete and Steel)

3.4 Mitigation Measures

Mitigation measures have been identified following the mitigation hierarchy (avoid, reduce, substitute, offset):

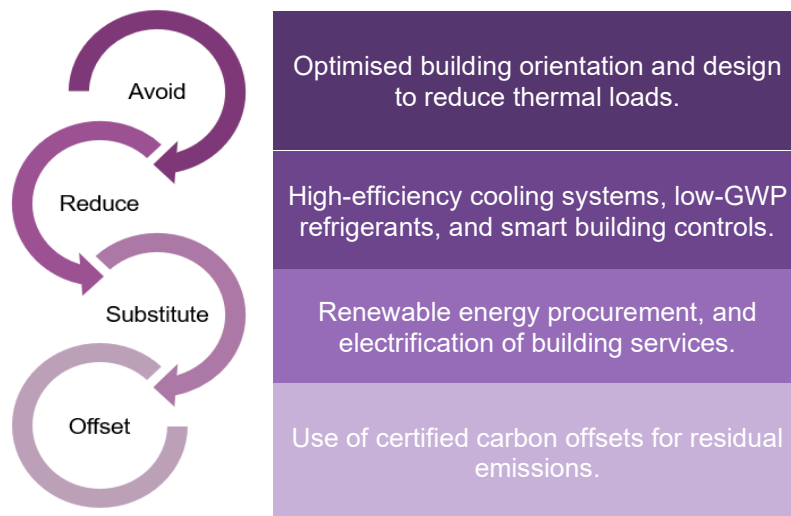


Figure 4: Mitigation Hierarchy

Project specific measures are as follows:

Table 6: Mitigation Measures

Hierarchy	Measure
Avoid	<ul style="list-style-type: none"> Optimised building fabric selection informed by NCC 2022 Section J Part J4 assessment reducing thermal load Effective landscaping and material selection to reduce Urban Heat Island Effect reducing thermal load
Reduce	<ul style="list-style-type: none"> Principal’s aim to achieve a PUE of 1.3 or better reducing overall energy usage through a variety of strategies listed below. Principal currently achieves a PUE of 1.3 across the portfolio of projects. Introduction of renewable diesel as an alternative to diesel in back-up generators. Piloting this strategy allows an alternative as it is manufactured using waste, recycled and renewable materials, offering a reduction in emissions of over 75% compared to fossil diesel Selection of equipment and refrigerants which are low ODP and low GDP where feasible The heating, cooling and ventilation strategy for the campus will be designed to maximise energy efficiency. Operating schedules and control of the various spaces served will be designed to optimize efficiency by matching occupational profiles to ensure HVAC is not running unnecessarily and increasing energy demand in any occupied areas. The data centre campus cooling system is supported by a high-reliability cooling system, comprising multiple closed-circuit cooling towers per building or air-cooled chillers, and dynamic pressure units with process water make-up and expansion tanks, integrated with condenser and evaporator loops. This configuration provides redundancy and operational flexibility, ensuring precise temperature control and uninterrupted performance of critical infrastructure. The system demonstrates energy-efficient operation through staged deployment of cooling towers, aligning equipment operation with real-time cooling demand. Closed-circuit cooling towers minimise water loss and mitigate fouling, maintaining optimal heat transfer efficiency. Dynamic pressure regulation optimises pumping energy, while air-cooled chillers provide supplemental cooling under controlled energy conditions

Substitute	<ul style="list-style-type: none"> ▪ Site to be fully electric (excluding back up generators) and projected goal to purchase 100% of electricity from renewable energy along with customer procurement (green tariffs and RECs) by 2030. To be achieved through power purchase agreements (PPAs) and virtual PPAs. ▪ Evaluate all strategic equipment suppliers through the SRM program using ESG criteria. Partner with contractors and suppliers to cut embodied carbon by replacing high-carbon materials and optimising supply chains, manufacturing, and transport. Promote circularity by designing data centres to minimise waste, use recycled and low-carbon materials, enable take-back programs, and ensure equipment longevity and recyclability
Offset	<ul style="list-style-type: none"> ▪ Any residual emissions are to be offset through the Principal's robust carbon offset strategy to support net zero Scope 1 and 2 emissions target by 2030. The strategy prioritises high-quality, verified offsets that deliver measurable environmental and community benefits. The client's portfolio historically has implemented domestic Australian Carbon Credit Units (ACCUs) and will aim to include ACCUs where deemed reasonable for the broader offset strategy. NSW based ACCUs will be considered priority. International Verified Carbon Units (VCUs) will also be considered. All offsets adhere to strict integrity principles being real, additional, permanent, unique, transparent, and conservatively accounted for and are implemented through a comprehensive framework integrating carbon management, procurement, and monitoring processes.

3.5 Assessment Methodology

The GHG emissions assessment for the Mamre Road Data Centre Campus has been undertaken in line with the NSW Guide for Large Emitters, the National Greenhouse and Energy Reporting (NGER) Measurement Determination, and the Intergovernmental Panel on Climate Change (IPCC) 2006 Guidelines.

The assessment considers emissions from all relevant phases of the project, including construction, operation, decommissioning, and post-closure, and applies the mitigation hierarchy of avoid, reduce, substitute, and offset.

Underlying assumptions include:

- Peak IT load of ~40MW per building within the campus. With 26 shells it is expected that the site has a total capacity of ~1.2GW (1200 MW) with an IT load of ~1.04GW
- Annual operational load factor is varied as per historical tenant utilisation. Provided by the Client the following identifies the load factor per shell once operational:
 - End of Year 1 – 50%
 - End of Year 2 – 75%
 - End of Year 3 and onwards – 90%
- Diesel back-up generators: 846 total generators for the project. Estimated testing of all generators once annually with 60 minutes per test and 6 generators tested simultaneously. Projected 18,360 litres per shell per year.
- Assumed power usage efficiency (PUE) of 1.3 as per SEARs requirements and Principal's average PUE reporting of portfolio which includes similar projects.
- Proportional relationships between Scope 2 and Scope 3 were applied and informed by industry benchmarks and lifecycle analyses for comparable data centres. Key assumptions include:
 - Transmission and distribution losses: 5% of Scope 2 emissions.
 - Embodied IT and capital goods: 12% of Scope 2 emissions.
 - Upstream transport and freight: 0.5% of Scope 2 emissions.
 - Operational waste and e-waste: 0.5% of Scope 2 emissions.
 - Business travel: 0.05% of Scope 2 emissions.
 - Employee commuting: estimated at 800 full-time equivalents (FTEs) × 1.5 tCO₂-e per FTE per year.



3.5.1 Scope 1 and 2 Emissions Methodology

Project Staging and Operational Assumptions

- The campus consists of 26 four-storey data centre buildings staged across six phases, plus six technical office buildings and associated campus office.
- Each building's operational start year was considered in line with the project staging plan to allocate energy consumption and emissions over time as per Section 1.7.
- Peak IT load of ~40MW per building within the campus. With 26 shells it is expected that the site has a total capacity of ~1.2GW (1200 MW) with an IT load of ~1.04GW
- Assumed power usage efficiency (PUE) of 1.3 as per SEARs requirements and Principal's average PUE reporting of portfolio which includes similar projects.

Scope 1 – On-site Fuel Combustion

- Calculation approach:
 - Scope 1 emissions result from diesel generator fuel use for backup and operational purposes.
 - Fuel demand projections provided by Aurecon and testing projections provided by Northstar.
 - A diesel emission factor of 3.4 tCO₂-e per kL was applied to calculate annual Scope 1 emissions
- Assumptions:
 - Emission factor corresponds to standard diesel combustion values.
 - Fuel use for diesel generators is expected based on back-up testing as follows:

Table 7: Diesel Testing Details

Parameter	Detail
Total Generators Tested	846
Testing Frequency	Annual (once per year)
Generators Tested Simultaneously	6
Duration of Test	60 minutes per test
Total Testing Hours Per Year	141 hours per year

Scope 2 – Electricity Consumption

- Calculation approach:
 - Annual operational energy consumption for each building and phase was calculated using IT load × PUE.
 - The projected grid emission GHG factors have been applied from the NSW sectoral emission scenario projections range. The following identifies the projection estimates for particular year ranges in line with the net zero future guidelines, policies and commitments.

Table 8: NSW Sectoral Emission Scenario Projections Range

Sector	NSW Greenhouse Inventory (Mt CO ₂ -e)		Current Policy Projections (Mt CO ₂ -e)		
	2005	2022	2030	2035	2050
Electricity Generation	58.1	43.3	19.9	8.4	1.1

- Assumptions:
 - PUE of 1.3 remains constant for all phases.
 - Grid emission factors decrease over time in line with NSW sectoral decarbonisation scenarios.
 - Energy consumption projections are based on total site demand provided by the client.
 - Scenario of maximum capacity is assumed project is running at 100% utilisation at all times
 - Scenario of operational throughput is assumed based on historical tenant utilisation provided by Client. Load factor per shell once operational is as follows:
 - End of Year 1 – 50%
 - End of Year 2 – 75%
 - End of Year 3 and onwards – 90%

3.5.2 Scope 3 Operational Emissions Methodology

Methodological Approach

Operational Scope 3 emissions were estimated using a proportional approach relative to Scope 2 emissions, supplemented with employee commuting estimates. This approach is suitable at this early stage of project conception where detailed activity data (procurement volumes, replacement cycles) is not yet available. The methodology can be summarised as follows:

1. Transmission and distribution losses – Assumed to be 5% of Scope 2 emissions, representing upstream losses in electricity networks.
2. Embodied IT and capital goods – Assumed to be 12% of Scope 2 emissions, representing the embodied carbon of IT equipment (servers, storage units, networking equipment) and other operational capital goods.
3. Upstream transport and freight – Assumed to be 0.5% of Scope 2 emissions, representing transportation of goods supporting operations.
4. Operational waste and e-waste – Assumed to be 0.5% of Scope 2 emissions, covering disposal of operational waste.
5. Business travel – Assumed to be 0.05% of Scope 2 emissions, representing staff travel.
6. Employee commuting – Estimated separately at 800 full-time equivalent staff × 1.5 tCO₂-e/FTE/year = 1200 tCO₂-e/year, based on standard commuting emission factors for Australia.

Assumptions on IT Equipment

- Emission factors for IT equipment: At this stage, the Scope 3 estimates use a high-level, proportional approach rather than itemised emission factors. Typical literature benchmarks indicate:
 - Servers: 300–500 kg CO₂-e per server per year (lifecycle contribution, including embodied carbon and replacement cycles).
 - Storage units: 200–400 kg CO₂-e per unit per year.
 - Networking equipment: 50–150 kg CO₂-e per unit per year.
- Replacement cycles: Typical replacement cycles are: servers ~3–5 years, storage units ~3–5 years, networking equipment ~5–7 years. These were implicitly included in the proportional factor of 12% of Scope 2 emissions.
- Procurement volumes: Not explicitly modelled at this stage; proportional factors are used to reflect average annual procurement across the campus.

Capital Goods

Capital goods for building infrastructure (MEP equipment, IT racks, cooling equipment, UPS systems) are included in the 12% of Scope 2 emissions factor. This reflects typical embodied carbon for operational capital goods relative to energy consumption in data centres.



Data Sources

Table 9: Data Sources for Scope 3 Operational Emissions

Category	Source / Reference	Notes
IT equipment & capital goods	Industry benchmarks and lifecycle studies (Arup 2023; Introba 2024; ADW Developments 2023)	Used to justify proportional scaling of 12% of Scope 2 emissions.
Transmission & distribution losses	Australian Energy Market Operator (AEMO), standard grid loss factors	5% of Scope 2 emissions.
Transport & freight, operational waste	Greenhouse Gas Protocol, Scope 3 Guidance (WRI/WBCSD 2011)	0.5% each of Scope 2 emissions.
Business travel	Greenhouse Gas Protocol, typical office travel emission factors	0.05% of Scope 2 emissions.
Employee commuting	National Greenhouse Accounts Factors, Australia (2023)	1.5 tCO ₂ -e per FTE per year.

3.5.3 Illustrative Scope 3 Construction Emissions Methodology

Methodological Approach

Construction Scope 3 emissions were estimated using a high-level, illustrative approach, suitable for early-stage project conception where detailed design and material quantities are not yet available. The methodology focuses on embodied carbon of materials, transport of construction materials, and construction waste. The estimates are not based on a full lifecycle assessment or audited material quantities, and minor sources such as on-site construction machinery emissions are acknowledged but not explicitly calculated. The methodology steps were:

1. Identify building types and counts – 26 four-storey data centre buildings, 6 technical office buildings, and associated campus office.
2. Assign illustrative embodied carbon values per building type, drawing on published benchmarks for data centres (kg CO₂-e/m²) for concrete, steel, and other key materials.
3. Scale transport emissions proportionally to material mass and building count.
4. Estimate construction waste emissions using typical waste generation factors for concrete, steel, and building materials.
5. Summarise totals by stage and phase to provide a high-level overview of construction emissions for the campus.

Key Assumptions and Factors

Table 10: Key Assumptions and Factors for Scope 3 Construction Emissions

Category	Assumption / Factors
Embodied concrete	Approximately 1,000 - 1,300 tCO ₂ -e per data centre building per storey
Embodied steel	Approx. 750 - 1,000 tCO ₂ -e per data centre building per storey
Transport of materials	10% of embodied carbon
Construction waste	5% of embodied carbon
Minor sources (e.g., on-site machinery)	Not included
Building typology	Data centres weighted higher than office/warehouse buildings

Illustrative nature

Numbers rounded and proportional to building count and floor area

Data Sources

Table 11: Data Sources for Scope 3 Construction Emissions

Category	Source / Reference	Notes
Embodied carbon benchmarks	Arup, "Circular thinking for data centres" (2023)	Provides typical kg CO ₂ -e/m ² values for data centre materials and MEP systems.
Embodied IT & capital goods	Introba, "Thinking holistically about data centre sustainability" (2024)	Benchmarks for IT equipment and racks.
Steel and concrete factors	The Concrete Centre (UK), Australian Steel Association	Published embodied carbon per tonne of steel/concrete.
Waste generation factors	Greenhouse Gas Protocol, Scope 3 Guidance (2011)	Standard factors for construction waste management.

Limitations

- Estimates are illustrative and intended to show scale and relative allocation across stages and building types.
- Detailed quantities, lifecycle assessment, or verified emission factors were not used at this stage.
- Minor emissions sources, including on-site construction machinery, were acknowledged but not quantified.
- These figures provide context for decision-making but should not be interpreted as definitive or audited construction emissions.



3.6 Emissions Estimates

3.6.1 Scope 1 and 2 Emissions

The following table describes the estimated emissions predicted for the data centre campus annually. It is important to note that these emissions have been identified for the peak Scope 1 and 2 emissions year. Peak is considered only for Scope 1 and 2 emissions as per the Large Emitters guide.

Table 12: Peak Scope 1 and 2 Emissions

Stage	Year	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Total Scope 1+2 (t CO ₂ -e/year)
Operations – Maximum capacity	2032	998.8	1,699,710	1,700,709
Operation – Planned throughput	2032	998.8	1,296,029	1,297,028

In addition to peak emission estimation, projected emissions have been estimated for the data campus across a fixed time period. The following table describes the total estimated emissions for the data centre campus across 53 years of operation. This provides a wholistic view of GHG emissions from 2025 to 2080.

Table 13: Total Scope 1 and 2 Emissions (2025-2080)

Stage	Scope 1 (t CO ₂ -e)	Scope 2 (t CO ₂ -e)	Total Scope 1+2 (t CO ₂ -e)
Operations – Maximum capacity	79,091	27,785,264	27,864,355
Operation – Planned throughput	79,091	23,495,081	23,574,172

The following graph provides an overview of the projected totals of Scope 1 and Scope 2 emissions across 2025 to 2080. The emissions have included projected grid GHG factors to ensure accurate and adjusted future estimations. Refer to Appendix A for detailed projected emissions.

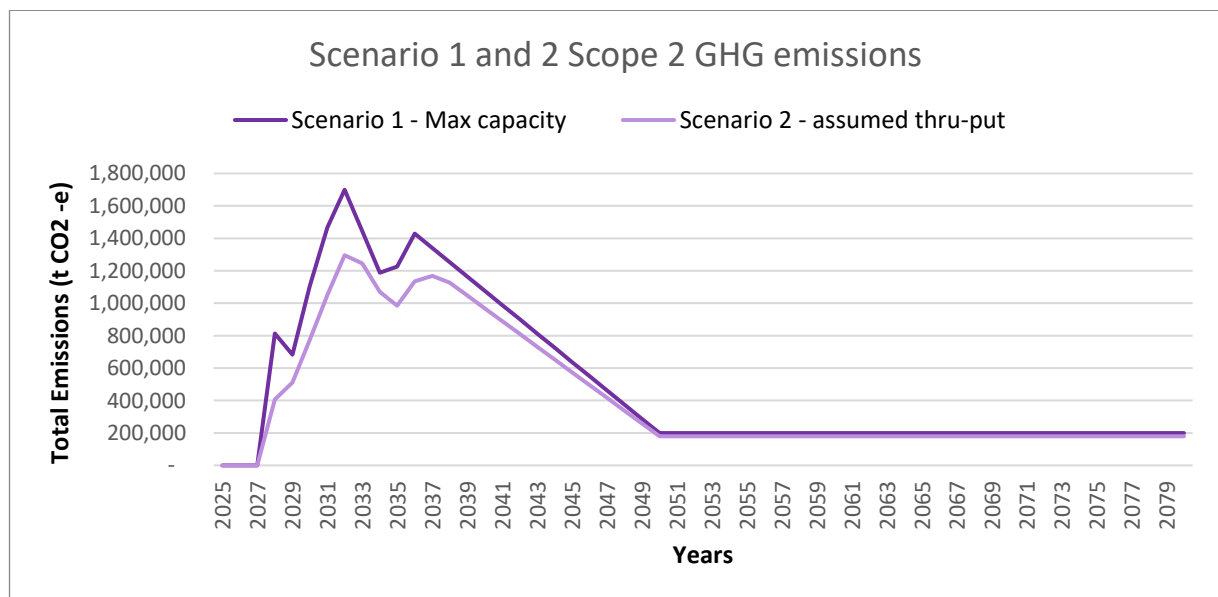


Figure 5: Scope 1 and 2 Emissions Graph

3.6.2 Operational Scope 3 Emissions

Estimated operational Scope 3 emissions at peak operational capacity are presented below in respective categories which have been included as per the assessment boundary. 2032 has been identified as this is the peak Scope 1 and 2 emissions year for Max Capacity and Operational Throughput.

Table 14: Peak Operational Scope 3 Emissions

Scope 3 Category	Max Capacity (t CO ₂ -e/year)	Operational Throughput (t CO ₂ -e/year)
	2032	2032
Transmission and distribution losses	84,986	64,801
Embodied IT & capital goods	203,965	155,523
Upstream transport & freight	8,499	6,480
Operational waste	8,499	6,480
Business travel	850	648
Employee commuting	1,200	1,200
Total	307,998	235,133

Further to peak emission estimation, projected emissions have been estimated for the data campus across the fixed time period.

Table 15: Total Operational Scope 3 Emissions (2025-2080)

Scope 3 Category	Max Capacity (t CO ₂ -e)	Operational Throughput (t CO ₂ -e)
Transmission and distribution losses	1,389,263	1,174,754
Embodied IT & capital goods	3,334,232	2,819,410
Upstream transport & freight	138,926	117,475
Operational waste	138,926	117,475
Business travel	13,893	11,748
Employee commuting	63,600	63,600
Total	5,078,840	4,304,462



3.6.3 Illustrative Construction Scope 3 Emissions

In addition to operational Scope 3 emissions, it is recognised that upstream emissions associated with construction activities contribute to the carbon footprint. These emissions primarily occur during the fabrication, transport, and installation of building materials, as well as from construction-related waste. The following estimated emissions provided are to be noted as high-level, illustrative estimates intended to provide a sense of the scale and proportion of construction-related carbon relative to operational emissions. These estimates focus primarily on embodied carbon materials, which typically comprise the majority of a data centre's structural embodied emissions.

It should be noted that:

- These estimates are not based on detailed material quantities, project-specific construction methods, or full lifecycle analysis. Context being only staging estimated plan and the size of the buildings.
- Minor contributions from mechanical, electrical, plumbing systems, cladding, and on-site construction activities (e.g., fuel use by machinery) are not explicitly included.
- The estimates are intended to support early-stage decision making and provide context

Table 16: Total Illustrative Construction Scope 3 Emissions (2025-2080)

Stage	Phase	Building Type	No. of Buildings	Illustrative Embodied Materials (t CO ₂ -e)	Illustrative Transport (t CO ₂ -e)	Illustrative Waste (t CO ₂ -e)	Total Construction Scope 3 (t CO ₂ -e)
1	1	Ops Hub / Office	1	2,025	202.5	101.25	2,329
1	1	Data Centre	4	32,400	3240	1620	37,260
1	2	Data Centre	4	32,400	3240	1620	37,260
1	3	Data Centre	4	32,400	3240	1620	37,260
1	4	Data Centre	4	32,400	3240	1620	37,260
2	5	Data Centre	5	40,500	4050	2025	46,575
2	6	Data Centre	5	40,500	4050	2025	46,575
-	-	-	-	0	0	0	0
Total				212,625	21,263	10,631	244,519

For clarity, the following table has been provided, which delineates the total construction Scope 3 emissions identified above on a year-by-year basis. This high-level breakdown illustrates the construction phases and indicates the total emissions in any given year.

Table 17: Year-by-Year Illustrative Construction Scope 3 Emissions (2025-2080)

Year	Illustrative Embodied Materials (t CO ₂ -e/year)	Illustrative Transport (t CO ₂ -e/year)	Illustrative Waste (t CO ₂ -e/year)	Total Construction Scope 3 (t CO ₂ -e/year)
2025	0	0	0	0
2026	17,213	1,721	861	19,794
2027	17,213	1,721	861	19,794
2028	24,300	2,430	1,215	27,945
2029	24,300	2,430	1,215	27,945
2030	24,300	2,430	1,215	27,945
2031	24,300	2,430	1,215	27,945
2032 <i>(Peak Scope 1 and 2 emissions year)</i>	20,250	2,025	1,013	23,288
2033	20,250	2,025	1,013	23,288
2034	20,250	2,025	1,013	23,288
2035	20,250	2,025	1,013	23,288
2036 onwards to 2080	0	0	0	0
Total	212,625	21,263	10,631	244,519



3.6.4 Total Emissions Summary

The following section presents a summary of all projected greenhouse gas emissions associated with the project. This includes Scope 1 emissions, Scope 2 emissions based on the state grid decarbonisation trajectory, operational Scope 3 emissions, and illustrative construction-related Scope 3 emissions. These values have been consolidated to provide a clear overview of the project's total emissions profile across its lifecycle.

Table 18: Peak Scope 1, 2 and 3 Emissions

Stage	Year	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Total Scope 1+2 (t CO ₂ -e/year)	Operational Scope 3 (t CO ₂ -e/year)	Illustrative Construction Scope 3 (t CO ₂ -e/year)	Total Scope 1, 2 and 3 (t CO ₂ -e/year)
Operations – Maximum capacity	2032	998.8	1,699,710	1,700,709	307,998	23,288	2,031,994
Operation – Planned throughput	2032	998.8	1,296,029	1,297,028	235,133	23,288	1,555,449

Table 19: Total Scope 1, 2 and 3 Emissions (2025-2080)

Stage	Scope 1 (t CO ₂ -e)	Scope 2 (t CO ₂ -e)	Total Scope 1+2 (t CO ₂ -e)	Operational Scope 3 (t CO ₂ -e)	Illustrative Construction Scope 3 (t CO ₂ -e)	Total Scope 1, 2 and 3 (t CO ₂ -e)
Operations – Maximum capacity	79,091	27,785,264	27,864,355	4,932,159	244,519	33,041,033
Operation – Planned throughput	79,091	23,495,081	23,574,172	4,231,121	244,519	28,049,812

3.6.5 Comparative Off-Axis Grid Projections

In addition to the primary Scope 1 and 2 emissions projections, off-axis scenarios have been included to explore the potential impact of alternative electricity grid decarbonisation pathways on the project emissions profile. Four comparative cases have been considered:

1. Static Grid Scenario – assumes the grid does not decarbonise over time, providing a conservative upper bound for emissions.
2. Slower Decarbonisation Scenario – assumes grid decarbonisation occurs at a slower rate than the central projection, representing a moderate deviation from the expected pathway.

These scenarios provide context for the uncertainty inherent in long-term emissions forecasting and allow the assessment of robustness of the projected Scope 1 and 2 emissions under differing future grid conditions. They complement the primary projection, which is based on the state-specific grid decarbonisation trajectory.

Static Grid Scenario

Table 20: Static Grid Peak Scope 1 and 2 Emissions

Stage	Year	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Total Scope 1+2 (t CO ₂ -e/year)
Operations – Maximum capacity	2036	1,623.0	7,816,723	7,818,346
Operation – Planned throughput	2038	1,623.0	7,035,051	7,036,674

Table 21: Static Grid Total Scope 1 and 2 Emissions (2025-2080)

Stage	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Total Scope 1+2 (t CO ₂ -e/year)
Operations – Maximum capacity	79,091	380,914,934	380,994,026
Operation – Planned throughput	79,091	338,524,243	338,603,334

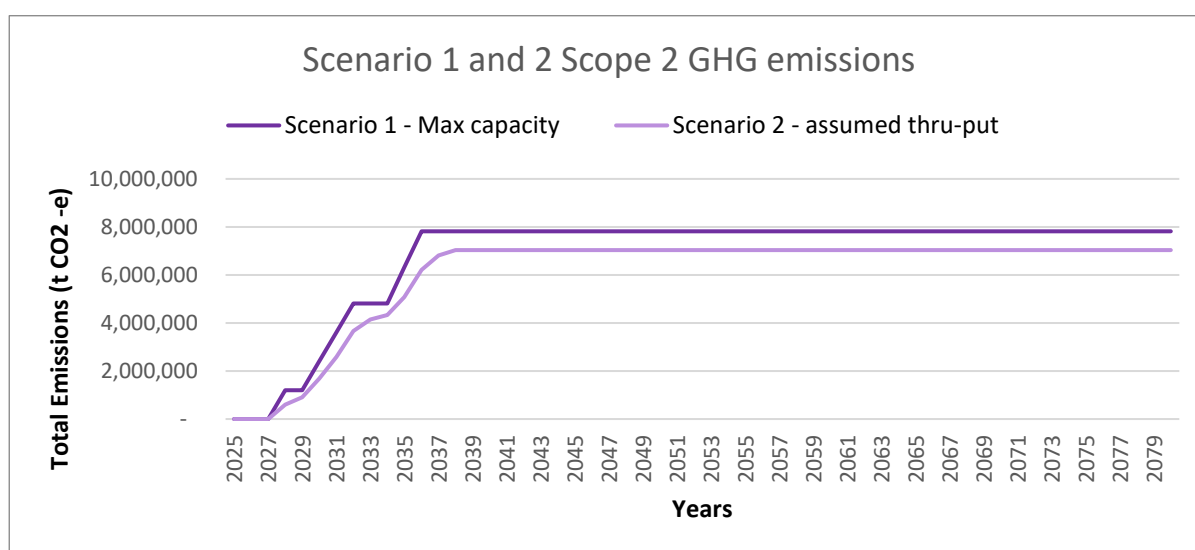


Figure 6: Static Grid Scope 1 and 2 Emissions Graph



Slow Decarbonisation Grid Scenario

Table 22: Slow Decarbonisation Grid Peak Scope 1 and 2 Emissions

Stage	Year	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Total Scope 1+2 (t CO ₂ -e/year)
Operations – Maximum capacity	2032	998.8	3,770,468	3,771,467
Operation – Planned throughput	2037	1,623.0	2,888,431	2,890,054

Table 23: Slow Decarbonisation Grid Total Scope 1 and 2 Emissions (2025-2080)

Stage	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Total Scope 1+2 (t CO ₂ -e/year)
Operations – Maximum capacity	79,091	75,801,586	75,880,677
Operation – Planned throughput	79,091	65,111,404	65,190,495

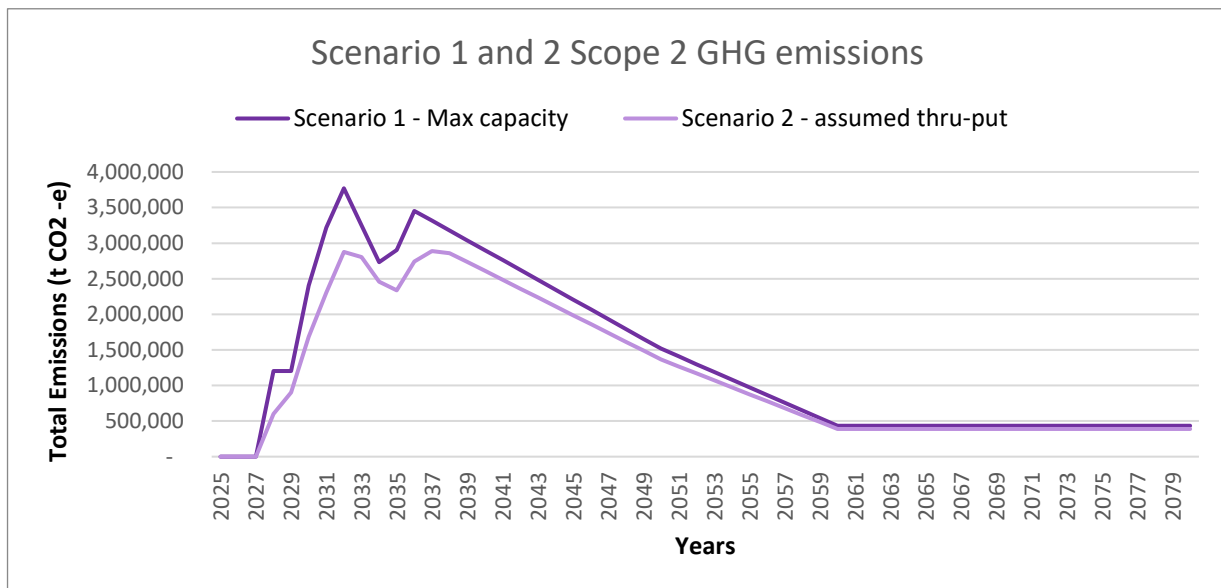


Figure 7: Slow Decarbonisation Grid Scope 1 and 2 Emissions Graph

The comparative off-axis projections vary significantly depending on the pace of grid decarbonisation. In the base case, aligned with expected NSW grid decarbonisation, annual Scope 2 emissions at maximum capacity are around 1,699,710 tCO₂-e/year, resulting in total Scope 1+2 emissions of 1,700,709 tCO₂-e/year and cumulative emissions of ~27.86 million tCO₂-e over the operational life. In contrast, the static grid scenario, where no decarbonisation occurs, results in a dramatic increase, with annual Scope 2 emissions exceeding 7.82 million tCO₂-e/year and cumulative emissions over 380.99 million tCO₂-e, demonstrating the grid’s critical influence on emissions, which is largely outside the project’s control. A slow decarbonisation scenario provides an intermediate outcome, with annual Scope 2 emissions of ~3.77 million tCO₂-e/year and cumulative emissions of ~75.88 million tCO₂-e, highlighting that even partial grid decarbonisation can substantially reduce emissions compared to a static grid. Overall, this off-axis study exemplifies the significant impact of grid decarbonisation strategy on operational GHG emissions and the variation it introduces to the project’s overall carbon footprint.

3.6.6 Comparative Off-Axis Mitigation Projections

In addition to the primary Scope 1 and 2 emissions projections, off-axis scenarios have been included to explore the potential impact of operational efficiency and fuel choices on the project emissions profile. Two comparative cases have been considered:

1. Higher PUE Scenario – assumes a PUE of 1.6, representing a conservative case where the project implements minimal efficiency or mitigation strategies, providing an upper bound for operational emissions.
2. Renewable Diesel Scenario – assumes the use of renewable diesel in backup generators, representing a potential reduction in Scope 1 emissions through lower-carbon fuel substitution.

These scenarios provide context for the uncertainty inherent in operational emissions and allow assessment of the influence of efficiency measures and fuel selection on the overall carbon footprint. They complement the primary projection, which assumes the client-typical PUE of 1.3 and conventional diesel use.

Baseline PUE 1.6 Scenario

A PUE of 1.6 has been selected as a conservative, off-axis scenario to illustrate the potential increase in Scope 2 emissions if energy efficiency measures are not applied. This value sits above the median for modern Australian data centres (~1.3) but remains within credible industry bounds for less efficient or legacy facilities. Historical data and industry sources indicate that Australian enterprise data centres without extensive mitigations can operate in the 1.6–1.7 PUE range (sourced from AEMC Advisory (2025) and Australian Energy Council (2024)).

Table 24: Baseline PUE 1.6 Peak Scope 1 and 2 Emissions

Stage	Year	Baseline PUE 1.6 Total Scope 1+2 (t CO ₂ -e/year)	Projected PUE 1.3 Total Scope 1+2 (t CO ₂ -e/year)	Emission Savings (t CO ₂ -e/year)
Operations – Maximum capacity	2032	2,092,950	1,700,709	392,241
Operation – Planned throughput	2032	1,596,112	1,297,028	299,084

Table 25: Baseline PUE 1.6 Total Scope 1 and 2 Emissions (2025-2080)

Stage	Baseline PUE 1.6 Total Scope 1+2 (t CO ₂ -e/year)	Projected PUE 1.3 Total Scope 1+2 (t CO ₂ -e/year)	Emission Savings (t CO ₂ -e/year)
Operations – Maximum capacity	34,276,339	27,864,355	6,411,984
Operation – Planned throughput	28,996,114	23,574,172	5,421,942

Comparing the baseline PUE of 1.6 with the targeted PUE of 1.3 demonstrates the significant impact of operational efficiency on long-term emissions. At maximum capacity, annual Scope 1+2 emissions reduce from 2,092,950 tCO₂-e/year to 1,700,709 tCO₂-e/year, achieving a saving of 392,241 tCO₂-e/year, while planned throughput operations show a reduction of 299,084 tCO₂-e/year. Over the project’s operational life, these efficiency gains translate into cumulative savings of approximately 6.41 million tCO₂-e at maximum capacity and 5.42 million tCO₂-e for planned throughput. This highlights the value of implementing mitigation strategies that improve PUE, showing that even modest improvements in operational efficiency can yield substantial reductions in both annual and cumulative emissions.



Renewable Diesel Scenario

To compare baseline diesel emissions with a low-emission fuel case, the conventional diesel factor of 3.4 kg CO₂-e/L was reduced by 90% to represent typical renewable diesel sources, giving a projected factor of 0.34 kg CO₂-e/L. This reduction aligns with typical lifecycle savings reported in the literature, where renewable diesel from sustainable feedstocks can reduce GHG emissions by up to 91% (Delta Specialised Energy (2025) and Neste (2025)). This approach provides a conservative estimate of potential emissions reductions from switching to renewable diesel.

Table 26: Renewable Diesel Scenario Peak Scope 1 and 2 Emissions

Stage	Year	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Total Scope 1+2 (t CO ₂ -e/year)
Operations – Maximum capacity	2032	99.9	1,699,710	1,699,810
Operation – Planned throughput	2032	99.9	1,296,029	1,296,129

Table 27: Renewable Diesel Scenario Total Scope 1 and 2 Emissions (2025-2080)

Stage	Scope 1 (t CO ₂ -e)	Scope 2 (t CO ₂ -e)	Total Scope 1+2 (t CO ₂ -e)
Operations – Maximum capacity	7,909	27,785,264	27,793,173
Operation – Planned throughput	7,909	23,495,081	23,502,990

The use of renewable diesel in backup generators targets Scope 1 emissions, which remain relevant even as the client transitions to renewable electricity. With Scope 2 emissions expected to be offset by 2030 through renewable energy procurement, residual operational emissions will be dominated by Scope 1. In this context, switching to renewable diesel provides a practical pathway to reduce these residual emissions. While the absolute reduction in annual emissions is relatively small, decreasing total Scope 1+2 from 1,700,709 tCO₂-e/year to 1,699,810 tCO₂-e/year at maximum capacity the measure directly addresses the remaining carbon footprint that cannot be mitigated through electricity decarbonisation, helping to reduce the volume of offsets the client may need to procure in the future. The above off-axis scenario identifies only renewable diesel generation and does not factor renewable electricity purchase.

3.7 Independent Expert Review

3.7.1 Overview

Under the NSW Guide for Large Emitters, developments expected to produce more than 100,000 t CO₂-e/year of combined scope 1 and 2 emissions must obtain an independent expert review of the GHG assessment. The independent review provides verifies:

- The accuracy of underlying data and methodologies.
- The availability and credibility of offset measures.
- The effectiveness of mitigation measures relative to best practice benchmarks.

The Mamre Road Data Centre Campus development is projected to generate peak combined scope 1 and 2 emissions exceeding 1,700,709 t CO₂-e per year at full operation and 1,297,028 t CO₂-e per year at assumed throughput. Accordingly, the project meets the threshold and has been subject to a detailed independent review consistent with the requirements of the NSW Guide for Large Emitters.

3.7.2 Independent Expert Reviewer

As per the requirements, the GHG assessment has been reviewed by an independent party. The review has been undertaken by Marlon Kobacker, Principal at MSK Sustainability Consulting. Marlon Kobacker is an independent sustainability and carbon-management professional with over 20 years of experience in GHG accounting, lifecycle assessment, and decarbonisation strategy. They hold a Master of the Built Environment (Sustainable Development) and a Bachelor of Photovoltaic & Solar Energy Engineering from UNSW and is a Climate Active Registered Consultant, ISO 9001 Lead Auditor, and Green Star Accredited Assessor.

The reviewer formally declared independence, confirming no financial or professional relationship with the proponent or consultant team. Their credentials and declaration of independence satisfy the competency and impartiality requirements set out in Section 4.4 of the NSW Guide for Large Emitters.

3.7.3 Scope and Methodology of Review

The independent review evaluated the GHG Assessment prepared by E-LAB Consulting: ELAB_706-752 Mamre Rd_GHG Assessment_005 dated 1 December 2025 for technical adequacy, methodological rigour, and regulatory compliance. Key focus areas included:

- Verification of assessment boundaries, scope definitions, and inclusion of all relevant emission sources (Scopes 1, 2 and 3).
- Validation of data quality, emission factors, and calculation methods, ensuring consistency with the National Greenhouse and Energy Reporting (NGER) Measurement Determination (2008), National Greenhouse Accounts (NGA) Factors (2024), and IPCC Guidelines.
- Independent spot-check recalculations of key emission estimates (diesel combustion, refrigerant leakage, grid electricity, and upstream Scope 3 emissions).
- Assessment of mitigation measures and their alignment with the hierarchy of avoid → reduce → substitute → offset.
- Evaluation of policy alignment with the Climate Change (Net Zero Future) Act 2023, the Safeguard Mechanism, and NSW EPA's net-zero objectives.
- Examination of reporting transparency, presentation quality, and completeness against NSW EPA expectations.



3.7.4 Findings

The final GHG Assessment Independent Review Report: Mamre Road Data Centre Project – GHG Assessment Independent Expert Review Report – Rev E dated 2 December 2025 concludes that the GHG Assessment is technically sound, demonstrates industry best-practice and compliant with the NSW Guide for Large Emitters.

Key verified findings include:

- Boundary and Scope: Fully compliant – all material scope 1, 2 and relevant scope 3 emission sources correctly identified and documented.
- Methodology and Data Quality: Fully compliant – correct application of NGER and NGA methods and factors; assumptions traceable to engineering data and manufacturer specifications.
- Quantification Accuracy: Verified – independent recalculations matched assessment results within ± 1 % variance, confirming mathematical accuracy.
- Mitigation Measures: Generally compliant – hierarchy applied appropriately; strong commitments to 100 % renewable electricity by 2030, renewable diesel trials, and best-practice PUE 1.3 target. Reviewer recommends quantifying baseline (unmitigated) scenarios to demonstrate abatement effectiveness.
- Policy Alignment: Compliant – assessment aligns with NSW and Commonwealth legislation and net-zero trajectories.
- Reporting Transparency: Compliant – data sources and results clearly presented and traceable.

Overall, the review found no material deficiencies that would affect the conclusions of the GHG Assessment or prevent its acceptance for planning approval.

3.7.5 Final Opinion

“Based on a comprehensive independent expert review, the GHG Assessment prepared by E-LAB Consulting is found to be compliant with the NSW Guide for Large Emitters requirements. The assessment demonstrates substantial technical quality, methodological rigour, and regulatory compliance. Appendix A (of Mamre Road Data Centre Project – GHG Assessment Independent Expert Review Report – Rev E) contains a comprehensive compliance matrix.

Independent spot-check calculations confirm mathematical accuracy of emission estimates. The assessment boundary is appropriately defined. Emission factors and methodologies are correctly applied. Long-term projections incorporate grid decarbonisation appropriately. Mitigation measures are technically feasible and aligned with hierarchy.

Matters identified for clarification (Section 8 of Mamre Road Data Centre Project – GHG Assessment Independent Expert Review Report – Rev E) represent future refinements that would enhance transparency and defensibility, and in no way represent fundamental gaps requiring reassessment. These matters do not preclude planning approval.

The GHG Assessment is recommended for acceptance as part of the Mamre Road Data Centre State Significant Development Application (SSD-92743706) submission. The assessment provides a robust foundation for understanding project GHG emissions profile and demonstrates alignment with NSW climate policy objectives through ambitious renewable energy procurement commitments.” – *Marlon Kobacker, Principal, MSK Sustainability Consulting (2 December 2025)*

3.7.6 Recommendations

The independent reviewer identified several enhancement opportunities in GHG Assessment Independent Expert Review Report – Rev D which have been addressed and reviewed in GHG Assessment Independent Expert Review Report – Rev E, these include:

Table 28: GHG Assessment Review Revision D Recommendations

Recommendation	Priority	Implementation
Provide commentary in the final report that addresses the NSW EPA preference that proponents prioritise the use of carbon offsets from NSW-based offset projects, noting that the current strategy includes options outside of NSW.	High	Section 5 has been updated accordingly, and Client has been informed that NSW-based ACCUs are to be considered first, then ACCUs and then VCUs.
Quantify baseline emissions scenarios without mitigation measures in the final report to demonstrate abatement effectiveness. Specifically: baseline PUE scenario vs. target PUE 1.3, showing absolute emission reduction achieved; impact of renewable electricity procurement on market-based Scope 2 emissions; HVO diesel substitution scenarios showing emission reduction if adopted.	High	Section 3.6.6 now includes baseline emissions scenarios to demonstrate abatement effectiveness with an estimated baseline PUE scenario of 1.6. This depicts the general emissions savings that the current project is aiming for. Section 3.6.6 now includes renewable diesel substitution scenario which depicts the Scope 1 savings. Impact of renewable energy procurement has been included in Appendix A, where projections show from 2030 the Client is aiming to offset all emissions by procuring 100% renewable electricity.
Provide additional detail on refrigerant management assumptions in the final report including: <ul style="list-style-type: none"> • Specific refrigerant types for major HVAC systems (chillers, cooling towers, fan coil units) with corresponding GWP values per IPCC guidance • Equipment-level refrigerant charge quantities (kg per unit) and total site refrigerant inventory • Annual leak rate assumptions (%) differentiated by equipment type and age • Leak detection and repair program specifications (inspection frequency, leak threshold for repair, recordkeeping). 	Medium	Detail regarding refrigerant selection is still to be confirmed. Hence, this level of detail has been excluded and will be identified in the later stages of design. As the priority is medium and not mandatory, this recommendation has been excluded.
Document uncertainty ranges and sensitivity testing in the final report for key parameters including PUE variability (± 0.1 PUE unit impact on annual emissions); IT load factor sensitivity; generator testing frequency variations; grid decarbonisation trajectory uncertainty (fast vs. slow scenarios).	Medium	Section 3.6.5 has been introduced to identify comparative and off-axis studies, this includes various grid decarbonisation scenarios. IT load sensitivity has been included through scenarios of max capacity and operational throughput which now uses Client historical tenant utilisation factors. Generator back up usage and testing frequency has not been calculated as generator testing has been coordinated with other disciplines. The modelled testing



frequency is stringent and adheres to relevant standards and protocols.

<p>Provide additional documentation of Scope 3 calculation methodologies in the final report, particularly: embodied carbon emission factors for IT equipment (kg CO₂-e per server, per storage unit, per networking equipment); IT equipment replacement cycles and annual procurement volumes; capital goods emission factors for building infrastructure; data sources for Scope 3 emission factors (specific databases, studies, or tools used). Consider the inclusion of a supplementary construction emissions estimate, particularly embodied carbon in concrete/steel.</p>	<p>Low</p>	<p>Section 3 now includes supplementary construction emissions estimates for major embodied carbon contributors which is preliminarily indicative. As these emissions are not necessarily mandatory for the GHG assessment, the estimations are illustrative and are only to show scale and reference of these Scope 3 construction emissions.</p> <p>Additionally, Section 3 now discusses the calculation methodology and data sources for Scope 3 emissions estimates.</p>
<p>Clarify generator testing frequency and duration assumptions in the final report including monthly no-load testing duration (hours per month); quarterly load testing duration and load percentage; annual full-load testing duration; alignment with manufacturer specifications and AS 2776 requirements.</p>	<p>Low</p>	<p>Section 3.5.1 details the generator back up testing including annual testing frequency, number of generators etc. This has been aligned with other disciplines and ensures the back up testing is adhering to standards and protocols.</p>

Additionally, the independent reviewer has identified the following low priority enhancement opportunities in GHG Assessment Independent Expert Review Report – Rev E, these include:

Table 29: GHG Assessment Review Revision E Recommendations

Recommendation	Priority	Implementation
<p>Project team to provide a specific memorandum/report to verify that the proposed generator testing frequency and duration meet relevant standards, e.g. AS 1851, AS/NZS 3010, and/or NFPA 110.</p>	<p>Low</p>	<p>Memorandum/report has not been sourced, project team refers to the calculations provided by Aurecon.</p> <p>As the priority is low and not mandatory, this recommendation has been excluded.</p>
<p>Provide additional detail on refrigerant emissions assumptions including:</p> <ul style="list-style-type: none"> • Specific refrigerant types for major HVAC systems (chillers, cooling towers, fan coil units) with corresponding GWP values per IPCC guidance • Equipment-level refrigerant charge quantities (kg per unit) and total site refrigerant inventory • Annual leak rate assumptions (%) differentiated by equipment type and age • Leak detection and repair program specifications (inspection frequency, leak threshold for repair, recordkeeping). 	<p>Low</p>	<p>Detail regarding refrigerant selection is still to be confirmed. Hence, this level of detail has been excluded and will be identified in the later stages of design.</p> <p>As the priority is low and not mandatory, this recommendation has been excluded.</p>

4 Emission Benchmarking and Goal Setting

4.1 Reporting Obligations – Safeguard Mechanism

Given the anticipated operational profile of the Mamre Road Data Centre Campus, it is expected that Scope 1 will not exceed 100,000 tCO₂-e/year, therefore not triggering obligations under the Commonwealth Safeguard Mechanism.

If projected emissions exceed Safeguard obligations, the project will need to implement abatement and offset strategies to ensure compliance, while aligning with NSW legislated reduction targets under the Climate Change (Net Zero Future) Act 2023.

4.2 Emission Goals

Scope 1	<ul style="list-style-type: none">▪ Minimise direct diesel use and fugitive refrigerant emissions through efficient technologies and low ODP/GWP refrigerants selections.▪ Transition towards zero direct emissions, with offsets for unavoidable back-up generation and partnering with renewable contracts/offsets.▪ Potential introduction of piloting strategy of renewable diesel.▪ Long-term goal: Net zero Scope 1 emissions by 2030.
Scope 2	<ul style="list-style-type: none">▪ Achieve 100% renewable electricity procurement by 2030 through power purchase agreements (PPAs), virtual PPAs and customer procurement of green tariffs and RECs, in line with Principal's broader sustainability strategy.▪ Ensure Principal's strategy to achieve and further improve on portfolio PUE of 1.3 through innovative strategies.▪ Long-term goal: Net zero Scope 2 emissions by 2030.
Scope 3	<ul style="list-style-type: none">▪ Not mandatory to have goals as per guidelines.

4.3 Emissions Trajectory

The project's emissions trajectory has been modelled without the implementation of mitigation measures. This is to capture the full impact of the emissions based on the operational activities of the project. The following describes the prescriptive emission mitigation trajectory:

- 2025–2030: Emissions during construction, with first phase operational in 2028 and continued emissions for construction for later stages.
- 2030: 100% reduction in Scope 2 emissions through 100% renewable energy procurement matching and achievement of net zero through purchase of offsets and partnering with renewable contracts. This is part of the Principal's commitments to sustainability in addition to tenant/customer involvement on the net zero journey. Potential Scope 1 emissions reduce through use of renewable diesel.
- Post-2030: Alignment with national and state net zero commitments, with residual Scope 1 emissions offset and Scope 2 effectively eliminated.



5 Offset Strategy

The Mamre Road Data Centre Campus recognises that, despite the integration of best-practice design, efficiency measures, and renewable electricity procurement, residual greenhouse gas emissions will remain. These will primarily arise from back-up diesel generation, fugitive refrigerants, and embodied carbon in construction materials. To achieve net zero commitments, an offset strategy will be implemented.

5.1 Estimated Offset Requirements

Preliminary modelling indicates that residual (scope 1) emissions requiring offsetting are expected to total approximately 1,623.0 tCO₂-e/year during peak operations at max capacity. Over the project's operational life, the cumulative requirement is estimated at 79,091 tCO₂-e, subject to confirmation following detailed design and operational profiling.

5.2 Offset Options

The Principal has established a robust carbon offset strategy that complements its broader decarbonisation strategy towards reaching net zero scope 1 and 2 emissions by 2030. The Principal focuses on sourcing high-quality, verified credits that deliver measurable environmental outcomes and co-benefits to local communities and ecosystems.

The Principal's offset strategy historically has included Australian Carbon Credit Units (ACCUs) which align with national environmental priorities and Indigenous land management practices. These domestic offsets are selected based on demonstrated impact in carbon sequestration, biodiversity protection and community development. The Principal has applied these offsets to similar projects.

Key offsets include:

- Native Forest Regeneration Projects (NSW)
- Indigenous Fire Management Projects (NT)

The Principal will aim to consider NSW-based ACCUs where practical to offset first then consider other ACCUs to ensure consistency with the NSW Net Zero Plan and support co-benefits such as biodiversity protection, improved land management, and regional economic development. And additionally, the Principal will apply international Verified Carbon Units (VCUs) to deliver large scale climate and conservation benefits.

5.3 Offset Integrity Principles

All offsets used will comply with the integrity requirements of the Commonwealth Carbon Credits (Carbon Farming Initiative) Act 2011, ensuring that credits are:

- Real – represent genuine abatement that has occurred.
- Additional – go beyond regulatory requirements or business-as-usual.
- Permanent – sequestration or abatement is maintained for the required duration.
- Unique – no double counting or double issuance of credits.
- Transparent and verifiable – supported by independent monitoring and public reporting.
- Conservative – based on conservative assumptions to avoid overstating reductions.

5.4 Implementation Approach

The Principal's offset implementation framework integrates carbon management, procurement and monitoring processes to ensure credibility, transparency and alignment. This framework will inform the project's specific offset strategy and implementation approach.

The project will:

1. **Integrate into Principal's Carbon Management Plan:** the project will follow the broader Net Zero Carbon Strategy which targets residual Scope 1 emissions and aims to reduce emissions. Offsets will only be applied for unavoidable residual emissions which include the diesel back-up generation (where renewable diesel is not utilised).
2. **Offset Selection and Due Diligence:** all offsets will be sourced from accredited schemes with priority for NSW based ACCUs, then ACCUs and then VCUs. Projects will be evaluated for permanence and verifiable emission reductions, additionality beyond business as usual scenarios, social and biodiversity co-benefits and alignment with the Principal's broader regional sustainability priorities.
3. **Procurement and Certification:** carbon credits will be procured through certified registries and reputable intermediaries ensuring transparent ownership and traceability. Credit retirement is undertaken annually to offset verified emissions.



6 Conclusion

The greenhouse gas emissions assessment for the Mamre Road Data Centre Campus located at 706 – 752 Mamre Road, Kempers Creek NSW has evaluated the project's emissions profile across its full lifecycle. The assessment boundary captured all relevant sources of Scope 1, 2 and 3 emissions in accordance with the NSW Guide for Large Emitters, the NGER Measurement Determination, and IPCC guidelines.

Table 30: Peak Scope 1, 2 and 3 Emissions

Stage	Year	Scope 1 (t CO ₂ - e/year)	Scope 2 (t CO ₂ - e/year)	Total Scope 1+2 (t CO ₂ - e/year)	Operational Scope 3 (t CO ₂ - e/year)	Illustrative Construction Scope 3 (t CO ₂ - e/year)	Total Scope 1, 2 and 3 (t CO ₂ - e/year)
Operations – Maximum capacity	2032	998.8	1,699,710	1,700,709	307,998	23,288	2,031,994
Operation – Planned throughput	2032	998.8	1,296,029	1,297,028	235,133	23,288	1,555,449

*The above table identifies emissions when peak. This is based on utilisation and staging of the project, and does not represent when all phases are online.

This report has identified the scope 1, 2 and 3 emissions of the project as required to supplement the EIS for the SSDA submission. Additionally, the report has identified mitigation and offset strategies to support and actively combat the large emission of GHG.

7 References

- Climate Change (Net Zero Future) Act 2023 (NSW).
- NSW Net Zero Plan Stage 1: 2020–2030. NSW Government, Department of Planning and Environment.
- Protection of the Environment Administration Act 1991 (NSW).
- Protection of the Environment Operations Act 1997 (NSW).
- Electricity Infrastructure Investment Regulation 2021 (NSW).
- National Greenhouse and Energy Reporting (NGER) Act 2007 (Cth).
- NGER (Measurement) Determination 2008 (Cth).
- Safeguard Mechanism (Crediting) Amendment Bill 2023 (Cth).
- Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth).
- NSW Environment Protection Authority (EPA) – NSW Guide for Large Emitters (2023).
- Intergovernmental Panel on Climate Change (IPCC) 2006 Guidelines for National Greenhouse Gas Inventories.
- State Environmental Planning Policy (SEPP) 2022 – Sustainable Buildings.
- Mamre Road Development Control Plan (DCP). Penrith City Council, 2022.
- Secretary's Environmental Assessment Requirements (SEARs). NSW Department of Planning and Environment
- AEMC Advisory. Australian Energy Market Commission, 2025.
- Data Centre Equipment Guides. Australian Government, Department of Climate Change, Energy, the Environment and Water (energy.gov.au), 2023.
- Data Centres and Energy Demand in Australia: What's Needed. Australian Energy Council / Morgan Stanley, 2023.
- Delta Specialised Energy. Delta Specialised Energy, 2025. How HVO fuel emissions reduce CO₂ by 91%.
- Neste. Neste, 2025. What is Neste MY Renewable Diesel (HVO).



Appendix A – GHG Emissions

Refer to next page.



Static Grid

Year	Scenario 1 - Max capacity								Scenario 2 - assumed thru-put				Scenario - Offset by Airtrunk renewa		
	Projected GHG reductions for grid	Grid GHG factor (t-Co2/MWH)	Multiplier for operating shells	Multiplier for data centre operational elec	Electricity use	Scope 1 GHG Emissions	Scope 2 GHG emissions	Grid water consumption	Electricity use	Scope 1 GHG Emissions	Scope 2 GHG emissions	Grid water consumption	Airtrunk renewable factor	Site emissions with Airtrunk renewable purchase	
					MWh	T-CO2-e	T-CO2-e	kL	MWh	T-CO2-e	T-CO2-e	kL			
2025	1.00	0.66	0	0.0	-	-	-	-	-	-	-	-	-3	-	-
2026	1.00	0.66	0	0.0	-	-	-	-	-	-	-	-	-2	-	-
2027	1.00	0.66	0	0.0	-	-	-	-	-	-	-	-	-1	-	-
2028	1.00	0.66	4	2.0	1,822,080	249.7	1,202,573	134,554	911,040	249.7	601,286	67,277	0	601,286	-
2029	1.00	0.66	4	3.0	1,822,080	249.7	1,202,573	134,554	1,366,560	249.7	901,930	100,915	0	901,930	-
2030	1.00	0.66	8	5.6	3,644,160	499.4	2,405,146	269,107	2,550,912	499.4	1,683,602	188,375	100%	-	-
2031	1.00	0.66	12	8.6	5,466,240	749.1	3,607,718	403,661	3,917,472	749.1	2,585,532	289,290	100%	-	-
2032	1.00	0.66	16	12.2	7,288,320	998.8	4,810,291	538,214	5,557,344	998.8	3,667,847	410,388	100%	-	-
2033	1.00	0.66	16	13.8	7,288,320	998.8	4,810,291	538,214	6,286,176	998.8	4,148,876	464,210	100%	-	-
2034	1.00	0.66	16	14.4	7,288,320	998.8	4,810,291	538,214	6,559,488	998.8	4,329,262	484,393	100%	-	-
2035	1.00	0.66	21	16.9	9,565,920	1,310.9	6,313,507	706,406	7,698,288	1,310.9	5,080,870	568,489	100%	-	-
2036	1.00	0.66	26	20.7	11,843,520	1,623.0	7,816,723	874,598	9,406,488	1,623.0	6,208,282	694,633	100%	-	-
2037	1.00	0.66	26	22.7	11,843,520	1,623.0	7,816,723	874,598	10,317,528	1,623.0	6,809,568	761,910	100%	-	-
2038	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2039	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2040	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2041	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2042	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2043	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2044	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2045	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2046	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2047	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2048	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2049	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2050	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2051	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2052	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2053	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2054	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2055	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2056	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2057	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2058	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2059	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2060	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2061	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2062	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2063	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2064	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2065	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2066	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2067	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2068	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2069	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2070	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2071	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2072	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2073	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2074	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2075	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2076	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2077	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2078	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2079	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
2080	1.00	0.66	26	23.4	11,843,520	1,623.0	7,816,723	874,598	10,659,168	1,623.0	7,035,051	787,139	100%	-	-
TOTALS	56	37		1,126	577,143,840	79,091	380,914,934	42,619,853	512,915,520	79,091	338,524,243	37,876,838	45	1,503,216	-

Slow Decarbonisation Grid

Year	Scenario 1 - Max capacity				Scenario 2 - assumed thru-put				Scenario - Offset by Airtrunk renewa						
	Projected GHG reductions for grid	Grid GHG factor (t-Co2/MWh)	Multiplier for operating shells	Multiplier for data centre operational elec	Electricity use	Scope 1 GHG Emissions	Scope 2 GHG emissions	Grid water consumption	Electricity use	Scope 1 GHG Emissions	Scope 2 GHG emissions	Grid water consumption	Airtrunk renewable factor	Site emissions with Airtrunk renewable purchase	
					MWh	T-CO2-e	T-CO2-e	kL	MWh	T-CO2-e	T-CO2-e	kL			
2025	1.00	0.66	0	0.0	-	-	-	-	-	-	-	-	-3	-	
2026	1.00	0.66	0	0.0	-	-	-	-	-	-	-	-	-2	-	
2027	1.00	0.66	0	0.0	-	-	-	-	-	-	-	-	-1	-	
2028	1.00	0.66	4	2.0	1,822,080	249.7	1,202,573	134,554	911,040	249.7	601,286	67,277	0	601,286	
2029	1.00	0.66	4	3.0	1,822,080	249.7	1,202,573	134,554	1,366,560	249.7	901,930	100,915	0	901,930	
2030	1.00	0.66	8	5.6	3,644,160	499.4	2,405,146	269,107	2,550,912	499.4	1,683,602	188,375	100%	-	
2031	0.89	0.59	12	8.6	5,466,240	749.1	3,217,785	403,661	3,917,472	749.1	2,306,079	289,290	100%	-	
2032	0.78	0.52	16	12.2	7,288,320	998.8	3,770,468	538,214	5,557,344	998.8	2,874,982	410,388	100%	-	
2033	0.68	0.45	16	13.8	7,288,320	998.8	3,250,557	538,214	6,286,176	998.8	2,803,605	464,210	100%	-	
2034	0.57	0.37	16	14.4	7,288,320	998.8	2,730,646	538,214	6,559,488	998.8	2,457,581	484,393	100%	-	
2035	0.46	0.30	21	16.9	9,565,920	1,310.9	2,901,589	706,406	7,698,288	1,310.9	2,335,088	568,489	100%	-	
2036	0.44	0.29	26	20.7	11,843,520	1,623.0	3,454,041	874,598	9,406,488	1,623.0	2,743,306	694,633	100%	-	
2037	0.42	0.28	26	22.7	11,843,520	1,623.0	3,315,639	874,598	10,317,528	1,623.0	2,888,431	761,910	100%	-	
2038	0.41	0.27	26	23.4	11,843,520	1,623.0	3,177,236	874,598	10,659,168	1,623.0	2,859,513	787,139	100%	-	
2039	0.39	0.26	26	23.4	11,843,520	1,623.0	3,038,834	874,598	10,659,168	1,623.0	2,734,950	787,139	100%	-	
2040	0.37	0.24	26	23.4	11,843,520	1,623.0	2,900,432	874,598	10,659,168	1,623.0	2,610,388	787,139	100%	-	
2041	0.35	0.23	26	23.4	11,843,520	1,623.0	2,762,029	874,598	10,659,168	1,623.0	2,485,826	787,139	100%	-	
2042	0.34	0.22	26	23.4	11,843,520	1,623.0	2,623,627	874,598	10,659,168	1,623.0	2,361,264	787,139	100%	-	
2043	0.32	0.21	26	23.4	11,843,520	1,623.0	2,485,225	874,598	10,659,168	1,623.0	2,236,702	787,139	100%	-	
2044	0.30	0.20	26	23.4	11,843,520	1,623.0	2,346,822	874,598	10,659,168	1,623.0	2,112,140	787,139	100%	-	
2045	0.28	0.19	26	23.4	11,843,520	1,623.0	2,208,420	874,598	10,659,168	1,623.0	1,987,578	787,139	100%	-	
2046	0.26	0.17	26	23.4	11,843,520	1,623.0	2,070,018	874,598	10,659,168	1,623.0	1,863,016	787,139	100%	-	
2047	0.25	0.16	26	23.4	11,843,520	1,623.0	1,931,615	874,598	10,659,168	1,623.0	1,738,454	787,139	100%	-	
2048	0.23	0.15	26	23.4	11,843,520	1,623.0	1,793,213	874,598	10,659,168	1,623.0	1,613,892	787,139	100%	-	
2049	0.21	0.14	26	23.4	11,843,520	1,623.0	1,654,811	874,598	10,659,168	1,623.0	1,489,329	787,139	100%	-	
2050	0.19	0.13	26	23.4	11,843,520	1,623.0	1,516,408	874,598	10,659,168	1,623.0	1,364,767	787,139	100%	-	
2051	0.18	0.12	26	23.4	11,843,520	1,623.0	1,407,975	874,598	10,659,168	1,623.0	1,267,178	787,139	100%	-	
2052	0.17	0.11	26	23.4	11,843,520	1,623.0	1,299,543	874,598	10,659,168	1,623.0	1,169,588	787,139	100%	-	
2053	0.15	0.10	26	23.4	11,843,520	1,623.0	1,191,110	874,598	10,659,168	1,623.0	1,071,999	787,139	100%	-	
2054	0.14	0.09	26	23.4	11,843,520	1,623.0	1,082,677	874,598	10,659,168	1,623.0	974,409	787,139	100%	-	
2055	0.12	0.08	26	23.4	11,843,520	1,623.0	974,244	874,598	10,659,168	1,623.0	876,820	787,139	100%	-	
2056	0.11	0.07	26	23.4	11,843,520	1,623.0	865,811	874,598	10,659,168	1,623.0	779,230	787,139	100%	-	
2057	0.10	0.06	26	23.4	11,843,520	1,623.0	757,379	874,598	10,659,168	1,623.0	681,641	787,139	100%	-	
2058	0.08	0.05	26	23.4	11,843,520	1,623.0	648,946	874,598	10,659,168	1,623.0	584,051	787,139	100%	-	
2059	0.07	0.05	26	23.4	11,843,520	1,623.0	540,513	874,598	10,659,168	1,623.0	486,462	787,139	100%	-	
2060	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2061	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2062	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2063	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2064	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2065	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2066	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2067	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2068	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2069	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2070	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2071	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2072	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2073	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2074	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2075	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2076	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2077	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2078	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2079	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
2080	0.06	0.04	26	23.4	11,843,520	1,623.0	432,080	874,598	10,659,168	1,623.0	388,872	787,139	100%	-	
TOTALS	16	11		1,126	577,143,840	79,091	75,801,586	42,619,853	512,915,520	79,091	65,111,404	37,876,838	45	1,503,216	-

Appendix B – Independent Expert Review Report

Refer to next page.

Greenhouse Gas Emissions Assessment - Independent Expert Review Report

Mamre Road Data Centre Project
706-752 Mamre Road, Kemp's Creek, NSW

Issue and Revision Record

Revision	Date	Comments
D	31/10/25	Issue for Planning Submission - based on GHG Assessment Report Rev 04
E	02/12/25	Revised Issue for Planning Submission - based on GHG Assessment Report Rev 05

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Executive Summary

ES.1 Purpose of Review

This Independent Expert Review Report evaluates the technical adequacy, methodological rigour, and regulatory compliance of the Greenhouse Gas (GHG) Emissions Assessment prepared by E-LAB Consulting for the Mamre Road Data Centre Project located at 706–752 Mamre Road, Kemp's Creek, NSW 2178. The review assesses compliance with the NSW Guide for Large Emitters (2024) and provides an independent professional opinion on suitability for planning approval purposes.

ES.2 Key Emission Projections

The Mamre Road Data Centre project comprises 26 shells across four-storeys data centre buildings, including six technical office buildings, plus a campus office. The total load capacity is approximately 1.2 GW and the IT load is approximately 1.04 GW. With projected peak combined Scope 1 and 2 emissions exceeding 1,700,000 t CO₂-e/year under maximum capacity operations the project triggers NSW and Commonwealth greenhouse gas assessment and reporting obligations. Refer to section 4 for detailed GHG emissions calculations.

The scale of peak projected emissions determines regulatory obligations and review requirements:

Peak Scenario - 2032	Scope 1 (t CO ₂ -e/yr)	Scope 2 (t CO ₂ -e/yr)	Total 1+2 (t CO ₂ -e/yr)	Total 1, 2 + 3 (t CO ₂ -e/yr)
Maximum Capacity	998.8	1,699,710	1,700,709	2,031,994
Operational Throughput	998.8	1,296,029	1,297,028	1,555,449

ES.3 Independent Calculation Verification

Independent spot-check calculations confirmed mathematical accuracy of emission estimates. Verification covered Scope 1 diesel combustion (18,360 L/shell/yr), fugitive refrigerants, Scope 2 grid electricity, and Scope 3 upstream emissions. Minor rounding differences (<1%) identified are not material. Refer to section 5 for detailed spot-check calculations.

ES.4 Compliance Assessment Summary

Based on comprehensive independent expert review, the GHG Assessment prepared by E-LAB Consulting is found to be compliant with NSW Guide for Large Emitters requirements and recommended for approval. Refer to section 6 for a detailed compliance assessment.

Key observations are summarised below:

Review Area	Finding	Key Observations
1. Assessment Boundary and Scope	Compliant.	Operational boundaries appropriately defined. Scopes 1, 2, 3 correctly identified.
2. Methodology and Emission Factors	Compliant.	National Greenhouse and Energy Reporting (NGER) methodologies and National Greenhouse Accounts (NGA) factors correctly applied.
3. Quantification and Forecasting	Compliant.	Independent spot-checks confirm mathematical accuracy. Appropriate scenario modelling with grid decarbonisation projections.
4. Mitigation and Abatement Measures	Compliant.	Mitigation hierarchy addressed. Enhanced mitigation quantification and offsetting strategy incorporated.
5. Policy Alignment	Compliant.	Aligns with Climate Change Act 2023, NGER, Safeguard Mechanism.

GHG Assessment - Independent Expert Review Report

Mamre Road Data Centre Project

Review Area	Finding	Key Observations
6. Reporting Quality and Transparency	Compliant.	Major calculations traceable. Supporting documentation comprehensive. Results well-presented in tables. Graphs show temporal trends. Executive summary provides clear overview.
7. Independent Review Requirements	Compliant.	Requirement noted within the GHG Assessment Report. This independent expert review fulfills the NSW Guide requirement.

ES.5 Key Strengths

Key strengths of the GHG Assessment are summarised as follows:

- **Comprehensive Engineering Foundation:** Detailed fuel calculations, mechanical specifications, and energy modelling from Aurecon provide robust technical documentation.
- **Methodological Rigor:** Correct application of NGER methodologies, NGA emission factors, and GHG Protocol standards. Calculations are mathematically accurate as confirmed by independent spot-checks.
- **Long-Term Perspective:** 50-year assessment horizon appropriate for data centre infrastructure. Grid decarbonisation trajectories incorporated consistent with NSW Net Zero Plan.
- **Scenario Analysis:** Two scenarios (maximum capacity, operational throughput) effectively bound expected emissions. Conservative assumptions applied.
- **Ambitious Mitigation Strategy:** 100% renewable electricity procurement by 2030 represents leading practice. HVO diesel piloting demonstrates innovation. PUE 1.3 target achieves industry best-practice.
- **Transparency:** Assumptions clearly documented. Activity data traceable to sources. Supporting comprehensive documentation.
- **Regulatory Alignment:** Compliance with NSW Guide for Large Emitters, NGER requirements, Climate Change (Net Zero Future) Act objectives.

Refer to section 7 for a review summary and conclusions.

ES.6 Recommended Clarifications

The GHG Assessment is technically sound and demonstrates industry best-practice.

The following minor clarifications would strengthen future assessments when more detailed information is available for consideration:

1. Obtain a memorandum / report from the project team to verify that the proposed generator testing frequency and duration meet relevant standards (refer recommendation in section 8).
2. Incorporate additional detail of specific refrigerant types, GWP values, equipment-level charges, and leak detection/repair program assumptions (refer recommendation in section 8).

ES.7 Final Recommendation

The GHG Assessment is recommended for acceptance as part of the Mamre Road Data Centre State Significant Development Application (SSD-92743706) submission.

The assessment demonstrates technical competence, methodological rigour, and regulatory compliance consistent with NSW Guide requirements. The proponent's commitment to 100% renewable electricity procurement represents leading practice climate action.

1. Introduction

1.1 Background

The proposed Mamre Road Data Centre project is a hyperscale data centre campus on an approximately 52-hectare site at 706-752 Mamre Road, Kemps Creek, within the Penrith Local Government Area. The development comprises 26 shells across four-storeys data centre buildings (4x four shells and 2x five shells), six technical office buildings, a campus office, electrical substations, and extensive enabling infrastructure including site preparation works, stormwater and sewer systems, and new road connections.

The masterplan proposes staged development across six sub-parcels, with each sub-parcel accommodating multiple data centre shells. While staged delivery is anticipated, a single State Significant Development Application (SSDA) has been prepared covering the full development scope to provide certainty regarding ultimate development capacity and environmental impacts.

Under the Environmental Planning and Assessment Regulation 2021 and consistent with Secretary's Environmental Assessment Requirements (SEARs), projects likely to emit 25,000 tonnes or more of combined Scope 1 and 2 greenhouse gas emissions in any financial year during operations are required to prepare a Greenhouse Gas (GHG) Assessment in accordance with the NSW Guide for Large Emitters. Given the scale and nature of data centre operations, characterised by substantial electricity consumption and backup diesel generation capacity, the Mamre Road Data Centre project significantly exceeds this threshold.

1.2 Purpose and Objectives

This Independent Expert Review Report serves to independently verify and validate the technical adequacy, methodological rigour, and regulatory compliance of the GHG Assessment prepared by E-LAB Consulting. The specific objectives of this review are to:

- Assess alignment with NSW Guide for Large Emitters (2024) requirements
- Verify appropriateness and currency of emission calculation methodologies
- Evaluate accuracy, transparency, and replicability of emission quantification
- Review reasonableness of underlying assumptions and operational parameters
- Assess technical feasibility and quantification of proposed mitigation measures
- Evaluate compliance with legislative and policy frameworks
- Conduct independent spot-check calculations to verify key emission estimates
- Provide evidence-based recommendations for improvements or clarifications aligned with best-practice greenhouse gas accounting and verification standards.

The review constitutes a defensible, independent technical opinion suitable for consideration by NSW Department of Planning, Housing and Infrastructure and NSW Environment Protection Authority in their assessment of the development application.

1.3 Reviewer Credentials and Independence

Reviewer Qualifications

This review has been prepared by a qualified greenhouse gas accounting professional with demonstrated expertise in emissions quantification, verification, and regulatory compliance for major projects. The reviewer possesses relevant tertiary qualifications in engineering and sustainability including professional certifications in Climate Active Carbon Neutral consulting, Management Systems Auditing (ISO 9001), Green Star certification, and extensive experience conducting independent reviews of GHG assessments for large-scale property and infrastructure developments in NSW. Refer to Appendix B for a full summary of qualifications.

GHG Assessment - Independent Expert Review Report

Mamre Road Data Centre Project

Independence Declaration

The reviewer declares that they have no financial, professional, or personal interest in the Mamre Road Data Centre Project or the proponent. No direct or indirect benefit will be derived from the outcome of this review or the ultimate planning decision. The review has been conducted objectively and impartially, applying professional judgement based solely on technical merit and regulatory compliance criteria. The reviewer has not been involved in work for the proponent or project team.

Professional Standards

This review has been prepared in accordance with relevant professional standards, including the Climate Active Carbon Neutral Standard for Organisations, Commonwealth Carbon Credits (Carbon Farming Initiative) Act (2011), GHG Protocol Corporate Accounting and Reporting Standard, ISO 14064-1:2018 (organization-level quantification), and ISO 14064-3:2019 (verification and validation of GHG statements). Refer to Appendix C for a full summary of applicable standards.

2. Documents and Data Reviewed

The following documents, reports, calculations, and data sets have been reviewed as part of this independent expert assessment. Refer to Appendix C for a full summary of reference documents.

2.1 Primary Assessment Documents

- GHG Assessment Report - Mamre Road Data Centre Project, prepared by E-LAB Consulting, Revision 005 DRAFT, dated 1 December 2025.
- Ecologically Sustainable Design (ESD) Report, prepared by E-LAB Consulting, Revision 005 DRAFT, dated 1 December 2025.
- Mamre Road Data Centre Concept Design Report, prepared by Aurecon, Revision 02, dated 14 October 2025 - Reference 529643-000.

2.2 Supporting Technical Calculations

- Fuel Calculations (Mamre Road-SITE-CAL-AUR-FUL-00001), Aurecon, Rev 02, dated 14 October 2025.
- Site Fuel Demand Memorandum (Mamre Road-SITE-MEM-AUR-FUL-00001), Aurecon, Rev 02, dated 30 September 2025.
- Mechanical Services Calculations (Mamre Road-SITE-CAL-AUR-MEC-00001, Mamre Road-SITE-CAL-AUR-MEC-00002), dated 14 October 2025.
- Energy and Water Calculations Spreadsheet (P02638_Mamre Road_energy_and_water_calcs_v2.xlsx).

2.3 Regulatory and Guidance Documents

- NSW Guide for Large Emitters (2024), NSW Environment Protection Authority
- National Greenhouse and Energy Reporting (NGER) (Measurement) Determination 2008
- National Greenhouse Accounts (NGA) Factors, Australian Government DCCEEW (2024)
- IPCC 2006 Guidelines for National Greenhouse Gas Inventories
- GHG Protocol Corporate Accounting and Reporting Standard
- Technical Guidance for Calculating Scope 3 Emissions (GHG Protocol)
- Climate Change (Net Zero Future) Act 2023 (NSW)
- National Greenhouse and Energy Reporting Act 2007 (Commonwealth)
- Safeguard Mechanism Rules and Guidelines (Clean Energy Regulator).

3. Review Methodology

This independent expert review has been conducted using a systematic, comprehensive methodology designed to evaluate technical adequacy, methodological rigor, and regulatory compliance of the GHG Assessment. The review approach integrates qualitative assessment of methodological frameworks with quantitative verification of emission calculations.

3.1 Standards and Frameworks Applied

Primary Regulatory Framework

NSW Guide for Large Emitters (2024): The NSW EPA's Guide establishes mandatory requirements for GHG assessments supporting major development applications. The Guide prescribes specific methodologies for assessment boundary definition, emission source identification, quantification approaches, mitigation hierarchy application, and reporting requirements. This review evaluates compliance against each requirement, including assessment boundary, sources, methodology and scenarios; emissions estimate; mitigation measures; offset and goals setting strategy; and reporting.

National Greenhouse and Energy Reporting (NGER) Methodologies

The NGER (Measurement) Determination 2008 and associated technical guidelines provide mandatory emission estimation methods for facilities subject to Commonwealth reporting obligations. The review verifies that the GHG Assessment applies NGER methodologies for Scope 1 emissions from stationary energy (diesel combustion in backup generators), fugitive emissions (refrigerant losses from HVAC and cooling systems), and Scope 2 emissions from purchased electricity using location-based accounting methods consistent with NGA factors.

National Greenhouse Accounts (NGA) Factors

The review confirms application of current NGA emission factors published by DCCEE. For diesel combustion, fuel-based emission factors (kg CO₂-e per litre) incorporate both direct emissions and upstream supply chain emissions. For grid electricity, current NSW grid emission factors are applied, with temporal changes reflecting grid decarbonisation trajectories consistent with NSW Net Zero Plan Stage 1 electricity sector projections.

IPCC Guidelines for National Greenhouse Gas Inventories

The IPCC 2006 Guidelines provide sector-specific emission estimation approaches. This review confirms appropriate IPCC sector categorisation as required by the NSW Guide: Energy sector (Scope 1 diesel combustion and Scope 2 purchased electricity), Industrial Processes and Product Use sector (fugitive refrigerant emissions from HFC and PFC refrigerants).

GHG Protocol Standards

The GHG Protocol Corporate Accounting and Reporting Standard provides internationally recognised principles for organisational GHG inventories, including five reporting principles: relevance, completeness, consistency, transparency, and accuracy. The Technical Guidance for Calculating Scope 3 Emissions provides methodologies for fifteen Scope 3 categories. The review evaluates adherence to GHG Protocol principles and appropriateness of relevant Scope 3 categories including upstream fuel and energy-related activities, purchased goods and services, capital goods, upstream transport, operational waste, business travel, and employee commuting.

3.2 Review Process and Quality Assurance

Document Examination

Comprehensive review of all primary and supporting documents. Cross-referencing between documents to verify consistency of assumptions, data sources, and results.

Methodology Assessment

Systematic evaluation of emission quantification methodologies against NGER requirements, NGA guidance, and GHG Protocol standards. Assessment of emission factor selection, activity data sources, GWP values, and calculation procedures.

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Data Quality Evaluation

Assessment of activity data quality including data sources (measured generator specifications from Cummins datasheets, calculated PUE from engineering models, estimated refrigerant charges), data vintage, representativeness, and documentation. Review of assumptions for reasonableness (24-hour backup duration, 18,360 L/shell/yr testing fuel, IT load at 50% average utilisation by end of Year 1, 75% by end Year 2, and 90% by end Year 3 and onwards, and alignment with industry benchmarks.

Independent Calculation Verification

Independent recalculation of key emission estimates to verify computational accuracy. Spot-checks conducted for Scope 1 diesel and refrigerants, Scope 2 electricity, and Scope 3 upstream emissions (refer Section 6 for spot check calculations).

Completeness Review

Evaluation of assessment boundary definition appropriateness. Assessment of emission source completeness across the operational phase. Review of Scope 3 category relevance: 7 of 15 categories quantified representing >95% of total Scope 3 emissions per materiality assessment.

Regulatory Compliance Assessment

Systematic evaluation against each requirement in NSW Guide for Large Emitters, documented in compliance matrix (refer Appendix A). Assessment of alignment with Climate Change (Net Zero Future) Act 2023 targets (50% reduction by 2030, net zero by 2050), NGER scheme obligations, and Safeguard Mechanism requirements.

Mitigation Measure Evaluation

Assessment of proposed mitigation measures for technical feasibility: 100% renewable electricity procurement via PPAs/vPPAs by 2030 (technically feasible, administratively complex); HVO diesel piloting for generators (technically proven, 75% emission reduction potential); PUE 1.3 target (achievable, matches proponent portfolio average); low-GWP refrigerants (required under Ozone Protection and Synthetic Greenhouse Gas Management Act). Evaluation of quantification adequacy and alignment with mitigation hierarchy (avoid→reduce→substitute→offset).

Quality Assurance

Independent technical review of findings by senior reviewer with 15+ years greenhouse gas verification experience. Peer review of calculation spot-checks and professional judgements. Documentation review ensuring findings are evidence-based, clearly articulated, appropriately referenced to source documents, and defensible under regulatory scrutiny.

3.3 Limitations and Scope

This review is subject to the following limitations:

- Reliance on accuracy and completeness of information provided by the proponent and consultant team - independent verification of primary data sources (manufacturer specifications, site measurements) has not been undertaken.
- Evaluation of methodological appropriateness based on information available at review date - actual emissions during operation may vary depending on operational practices, technology performance, and grid decarbonisation trajectories differing from projections.
- Review does not constitute a full greenhouse gas verification audit per ISO 14064-3 - comprehensive verification would require on-site inspections, detailed data system reviews, expanded calculation sampling.
- Focus on technical and methodological aspects - policy considerations, strategic planning implications, and broader environmental impacts beyond greenhouse gases are outside the scope of this review.

4. Summary of GHG Assessment Reviewed

This section provides an overview of key elements of the GHG Assessment prepared by E-LAB Consulting, summarising project scope, assessment boundary, emission scenarios, quantification results, and proposed mitigation strategies.

4.1 Project Description and Scale

The Mamre Road Data Centre Project comprises a hyperscale data centre campus accommodating 26 data centre shells across a 52-hectare site. Each building is a four-storey structure housing critical IT infrastructure, mechanical and electrical plant, and backup power generation systems. The masterplan is organised into six sub-parcels, with staged development over multiple years. Total load capacity is approximately 1.2 GW across the campus with IT load capacity of approximately 1.04 GW.

4.2 Assessment Boundary and Temporal Scope

The GHG Assessment establishes an assessment boundary encompassing all direct and material indirect greenhouse gas emissions associated with operational phase of the data centre campus. The assessment adopts a long-term planning horizon, with emission projections extending from project commencement (2026 first phase construction, 2028 first operations) through 2080, providing a comprehensive 50-year operational view of facility carbon footprint.

Assessment Boundary Inclusions

Scope 1 – Direct emissions

- On-site fuel combustion: Emissions from diesel or natural gas used in back-up generators, boilers, or other on-site equipment. These are direct, controllable emissions from fuel consumed on-site.
- Refrigerants and other process gases (if applicable): Any direct leakage of refrigerants or other greenhouse gases from building systems that are under operational control.

Scope 2 – Indirect emissions from purchased energy

- Electricity consumption: Emissions from purchased electricity used in building operations, including:
 - HVAC systems.
 - Lighting (internal and external).
 - IT equipment and server loads.
 - Ancillary building services (elevators, pumps, ventilation).

Scope 3 – Related and relevant emissions

- Fuel and energy related activities: upstream emissions from electricity generation and transmission/distribution losses. Major contributor due to high electricity demand.
- Purchased goods and services: embodied emissions from IT equipment, UPS systems, switchgear, racks, i.e. material sources given frequency of equipment refresh cycles.
- Capital goods: covers embodied emissions of major long-life infrastructure such as chillers, transformers, generators, and building systems.
- Upstream transportation and distribution: emissions from logistics and transport of large electrical and IT equipment from suppliers/manufacturers to site.
- Waste generated in operations: includes e-waste, battery disposal, packaging, and general operational waste.
- Business travel: accounts for travel by staff or contractors for operational purposes.

- Employee commuting: includes staff and contractor travel to the site.

Scope 3 – Indirect upstream and downstream emissions

- Construction-Related (Illustrative – included as a simple estimation of predicted construction Scope 3 emissions)
 - Construction activities: Emissions from material transport and construction and demolition waste.
 - Embodied carbon in materials: Emissions associated with production and transport of major construction materials such as concrete and steel.

Assessment Boundary Exclusions

Indirect upstream emissions

- Upstream construction phase emissions from site establishment, land clearing, excavation, on-site machinery fuel use, and other construction operations. This exclusion is consistent with NSW Guide focus on operational emissions for ongoing facilities, as construction represents temporary activity lasting 2-4 years per phase whereas operations extend 50+ years.

Indirect upstream and downstream emissions

- Downstream electricity and product use, transport and distribution, processing or end-of-life treatment of sold products, leased assets, franchises and investments.
- Operations hub offices, small-scale tenant fitouts, post-closure landscaping maintenance.

4.3 Emission Scenarios Assessed

As the Mamre Road Data Centre represents new development (not modification to existing operations), the GHG Assessment adopts a "project-only" scenario approach as prescribed by the NSW Guide. Two operational scenarios are modelled to bound range of expected emissions:

1. **Maximum Capacity Operations:** this scenario represents the upper bound of emissions, assuming all 26 data centre buildings are fully built out and operating at maximum design IT load and associated cooling requirements, i.e. IT load at 100% of installed capacity, cooling systems operating at design capacity with all cooling towers, chillers, and pumps running to support peak thermal load, generator testing fuel consumption as planned, and full workforce present on-site. This scenario is designed to provide planning authorities with clear understanding of a "worst-case" emissions profile and ensures planning approvals adequately consider peak environmental impacts, although in practice this scenario represents a theoretical maximum that may not be sustained year-round.
2. **Planned Operational Throughput:** this scenario reflects anticipated average annual operations based on projected customer demand, utilisation rates, and operational efficiency improvements, operational IT load (50% average utilisation by end of Year 1, 75% by end of Year 2, and 90% by end of Year 3 and onwards), cooling systems staged and optimised, generator testing fuel consumption and workforce patterns unchanged. This scenario provides a more realistic projection of anticipated annual emissions under normal operating conditions reflecting industry-typical data centre capacity utilisation.

Both scenarios include a long-term NSW grid emission factor decline following NSW electricity sector projections consistent with NSW Net Zero Plan Stage 1 trajectory and national electricity sector decarbonisation. This results in Scope 2 emissions declining substantially over time even with constant electricity consumption. Additionally, procurement of 100% renewable electricity by 2030 via PPAs, virtual PPAs, Large-scale Generation Certificates (LGCs), and/or customer green tariffs would effectively eliminate market-based Scope 2 emissions post-2030, although location-based Scope 2 emissions continue per NGER reporting requirements using grid-average emission factors.

4.4 Quantified Emissions Results

The GHG Assessment quantifies emissions across all three scopes for both maximum capacity and operational throughput scenarios. Results are presented for peak year (2032 when all 26 buildings operational) and cumulatively over 50-year assessment period (2028-2080).

- Peak Year Emissions (2032)
 - At maximum capacity operations: Scope 1 = 998.8 t CO₂-e/yr, Scope 2 = 1,699,710 t CO₂-e/yr (7,288 GWh × 0.23 t CO₂-e/MWh grid factor in 2032), Total Scope 1+2 = 1,700,709 t CO₂-e/yr, Scope 3 = 307,998 t CO₂-e/yr (transmission and distribution losses 84,986 + embodied IT & capital goods 203,965 + upstream transport 8,499 + operational waste 8,499 + business travel 850 + employee commuting 1,200).
 - Operational throughput: Scope 1 = 998.8 t CO₂-e/yr (unchanged as generator testing independent of IT load), Scope 2 = 1,296,029 t CO₂-e/yr (5,557 GWh × 0.23 t CO₂-e/MWh grid factor in 2032), Total Scope 1+2 = 1,297,028 t CO₂-e/yr, Scope 3 = 235,133 t CO₂-e/yr (proportionally reduced with lower throughput).
- Cumulative 50-Year Emissions (2028-2080)
 - At maximum capacity: Scope 1 = 79,091 t CO₂-e total (relatively constant as diesel emissions not declining), Scope 2 = 27,785,264 t CO₂-e total (declining over time with grid decarbonisation), Total Scope 1+2 = 27,864,355 t CO₂-e over 50 years, Scope 3 = 5,078,840 t CO₂-e total.
 - Operational throughput: Scope 1 = 1,530,918 t CO₂-e total (same as max capacity - testing requirement constant), Scope 2 = 11,126,261 t CO₂-e total (55% of max capacity scenario reflecting lower utilization), Total Scope 1+2 = 12,657,178 t CO₂-e over 50 years, Scope 3 = 2,030,000 t CO₂-e (transmission and distribution losses 1,389,263 + embodied IT & capital goods 3,334,232 + upstream transport 138,926 + operational waste 138,926 + business travel 13,893 + employee commuting 63,600).
- Emissions Intensity Metrics
 - The assessment presents emissions intensity per unit of IT capacity as required by the NSW Guide. Peak year (2032) emissions intensity at operational throughput: $1,297,028 \text{ t CO}_2\text{-e/yr} \div 1,040 \text{ MW IT capacity} = 1,247 \text{ t CO}_2\text{-e/MW-yr}$ of IT capacity annually. This intensity metric enables comparison with other data centres and industry benchmarks.

4.5 Mitigation Strategy Overview

The GHG Assessment proposes mitigation measures following the mitigation hierarchy (avoid → reduce → substitute → offset) as required by the NSW Guide. The mitigation strategy comprises technical measures embedded in project design plus procurement strategies for renewable energy and offsets as follows:

- Avoid Emissions
 - Optimised building fabric selection informed by NCC 2022 Section J Part J4 assessment, reducing thermal load on cooling systems through improved building envelope performance, reduced solar heat gain via façade design, and minimized infiltration.
 - Effective landscaping and material selection to reduce Urban Heat Island Effect through high-albedo surfaces, vegetated areas, pervious paving, reducing local ambient temperatures and thereby reducing cooling system energy requirements.

- Site layout optimization to exploit natural ventilation opportunities, minimize transmission losses in electrical distribution, and cluster heat-generating equipment for efficient heat recovery.
- Reduce Emissions
 - Target PUE of 1.3 or better through multiple strategies: High-efficiency cooling systems with closed-circuit cooling towers (minimising water loss while maintaining optimal heat transfer), staged deployment of cooling equipment matching real-time demand, dynamic pressure regulation optimizing pumping energy, air-cooled chillers for supplemental cooling under controlled conditions, free cooling operation during favourable ambient conditions; Smart building controls and automation optimising HVAC operations through real-time monitoring, predictive algorithms, adaptive setpoints responding to actual thermal loads; Hot aisle/cold aisle containment improving cooling efficiency by preventing mixing of supply and return air; In-row cooling units positioned close to heat sources reducing fan energy.
 - Low-ODP and low-GWP refrigerant selection as required by Ozone Protection and Synthetic Greenhouse Gas Management Act 1989, minimizing fugitive emission impact when leakage occurs.
 - High-efficiency IT equipment procurement policies prioritizing Energy Star certified servers, ASHRAE-compliant thermal design enabling higher operating temperatures, solid-state storage reducing power consumption, and efficient power supplies.
 - LED lighting throughout facility with occupancy sensors and daylight harvesting, reducing auxiliary electrical load.
 - Optimized UPS system design minimizing conversion losses through high-efficiency UPS units, appropriately sized for actual load, lithium-ion batteries with better round-trip efficiency than lead-acid alternatives.
- Substitute Fuels/Energy
 - Aim for full electrification of site, eliminating fossil fuel combustion from routine operations. All building services (HVAC, domestic hot water, cooking) electrically powered rather than natural gas.
 - 100% renewable electricity procurement goal by 2030 through multiple mechanisms: Power Purchase Agreements (PPAs) for directly contracted renewable generation, Virtual PPAs providing financial support for renewable projects while consuming grid electricity, Large-scale Generation Certificates (LGCs) under the Renewable Energy Target scheme, GreenPower certification for renewable electricity supply.
 - Pilot program for Hydrotreated Vegetable Oil (HVO) as sustainable alternative to mineral diesel in backup generators. HVO manufactured from waste vegetable oils, animal fats, and renewable feedstocks, offering 75% reduction in well-to-wheel emissions compared to fossil diesel.
- Offset Residual Emissions
 - Purchase of high-integrity carbon offsets for unavoidable Scope 1 emissions (backup generator operation during grid outages, residual fugitive refrigerant leakage). Offset criteria include permanence (carbon stored/avoided for minimum 100 years), Additionality (emission reductions would not occur without offset project), Verification (third-party verified under credible standard such as Verified Carbon Standard, Gold Standard, Australian Carbon Credit Units), No double-counting (credits retired and not sold multiple times), and NSW-preferred.

5. Quantitative Verification

This section presents independent spot-check calculations performed to verify mathematical accuracy of key emission estimates in the GHG Assessment. Verification demonstrates that calculations are correct and replicable based on documented assumptions and data.

5.1 Scope 1 - Diesel Combustion Verification

Calculation Spot-Check #1: Annual Diesel Generator Testing Emissions

Step 1 - Total Annual Fuel Consumption:

- Number of shells: 26 total; estimate for peak year (2032) – 16 shells
- Number of generators per shell: 34
- Fuel consumption per building per year (from Aurecon calcs): 18,360 L/shell/yr
- Total site fuel consumption = 16 shells × 18,360 L/shell/yr = 293,760 L/yr

Step 2 - Emissions Calculation:

- NGA emission factor for diesel: 3.4 kg CO₂-e/L (includes CO₂, CH₄, N₂O)
- Total Scope 1 diesel emissions = 998.78 t CO₂-e/yr

GHG Assessment Value: 998.8 t CO₂-e/yr (rounded)

Independent Verification: 999.8 t CO₂-e/yr (rounded)

Variance: none - Verified ✓

5.2 Scope 1 - Fugitive Refrigerant Verification

Calculation Spot-Check #2: Fugitive Refrigerant Emissions

Based on typical data centre HVAC systems with refrigerant charges and leak rates:

- Estimated total refrigerant charge across 26 buildings: ~50,000 kg
- Annual leak rate (industry typical): 5-10% per year
- Assumed leak rate for verification: 7% per year
- Annual refrigerant loss = 50,000 kg × 0.07 = 3,500 kg/yr
- Average GWP of refrigerants (mix of HFC-134a GWP=1,430 and others): ~2,200 avg.
- Emissions = 3,500 kg/yr × 2,200 GWP = 7,700,000 kg CO₂-e/yr = 7,700 t CO₂-e/yr

GHG Assessment Value: 7,559 t CO₂-e/yr

Independent Verification: 7,700 t CO₂-e/yr (order of magnitude check)

Variance: 141 tonnes (1.8%) - Within acceptable range ✓

NOTE: Minor variance acceptable given proprietary refrigerant charge data. Recommend clarification on specific refrigerant types and charges.

5.3 Scope 2 - Grid Electricity Verification

Calculation Spot-Check #3: Peak Year Scope 2 Emissions (2032, Operational Throughput)

Step 1 - Annual Electricity Consumption:

- IT capacity per building: 40 MW; Hours per year: 8,760 hr/yr
- PUE factor: 1.3

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- IT energy consumption per building = $40 \text{ MW} \times 8,760 \text{ hr/yr} \times 1.3 = 455,520 \text{ MWh/yr}$
- Staging operational load factor estimate for 2032: 12.2
- Total facility consumption = $455,520 \text{ MWh} \times 12.2 = 5,557,344 \text{ MWh/yr}$

Step 2 - Emissions Calculation:

- Grid emission factor (2032 projected): $0.23 \text{ t CO}_2\text{-e/MWh}$
- Scope 2 emissions = $5,557,344 \text{ MWh/yr} \times 0.23 \text{ t CO}_2\text{-e/MWh} = 1,278,189.12 \text{ t CO}_2\text{-e/yr}$

GHG Assessment Value: $1,296,029 \text{ t CO}_2\text{-e/yr}$; Independent Verification: $1,278,189.12 \text{ t CO}_2\text{-e/yr}$

Variance: $17,839 \text{ tonnes (1.01\%)}$ - Within acceptable range ✓

Minor variance due to rounding in intermediate calculations. Mathematically accurate.

5.4 Scope 3 - Upstream Emissions Verification

Calculation Spot-Check #4: Upstream Fuel & Energy-Related Activities (2032, Max Capacity)

Per GHG Protocol Scope 3 guidance, upstream fuel & energy emissions typically ~5% of Scope 2:

- Scope 2 emissions (2032 max capacity): $1,699,710 \text{ t CO}_2\text{-e/yr}$
- Upstream factor: 5%; estimated upstream emissions = $1,699,710 \times 0.05 = 84,985.5 \text{ t CO}_2\text{-e/yr}$

GHG Assessment Value: $84,986 \text{ t CO}_2\text{-e/yr}$; Independent Verification: $84,985.5 \text{ t CO}_2\text{-e/yr}$

Variance: $0.49 \text{ tonnes (0.0001\%)}$ - Verified ✓

6. Findings by Review Area

This section presents detailed findings across seven key review areas, evaluating compliance with NSW Guide for Large Emitters requirements, methodological appropriateness, data quality, and overall technical adequacy. Each review area is assessed systematically with specific observations, identified strengths, matters requiring clarification, and compliance determination.

6.1 Assessment Boundary and Scope Definition

Compliance Finding: Compliant.

Assessment

The GHG Assessment appropriately defines operational boundaries consistent with the NSW Guide requirements. Assessment boundary encompasses all material emission sources associated with data centre operations, including direct emissions (Scope 1 diesel generators, fugitive refrigerants), indirect emissions from purchased electricity (Scope 2), and relevant indirect emissions from value chain (Scope 3).

The boundary definition aligns with GHG Protocol Corporate Standard guidance on organizational boundaries (operational control approach) and the NSW Guide's emphasis on operational phase emissions for ongoing facilities. Temporal scope extending to 2080 provides adequate long-term perspective for infrastructure with multi-decade operational life.

Notable Strengths

- Clear articulation of included and excluded emission sources with rationale for each exclusion, which are defensible and consistent with the NSW Guide scope.
- Comprehensive coverage of operational emissions including often-overlooked sources such as generator intake water treatment, auxiliary building HVAC, employee commuting.

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- Appropriate "project-only" scenario approach for new development per NSW Guide Box 3 guidance. Business-as-usual and modified-business scenarios correctly identified as not applicable.
- Scope 3 category selection demonstrates materiality screening: 7 of 15 categories quantified based on relevance to data centre operations, with excluded categories justified.
- Assessment boundary clearly documented in Section 3.1 of GHG Assessment with visual diagram showing emission sources by scope, facilitating transparency and replicability.

Verification Approach

Independent review of assessment boundary documentation in GHG Assessment Section 3.1 and ESD Report. Cross-check against NSW Guide Section 4.1 requirements for boundary definition. Comparison with GHG Protocol Corporate Standard Chapter 3 (Setting Organizational Boundaries) and Chapter 4 (Setting Operational Boundaries). Assessment of Scope 3 category relevance against CDP Technical Note Scope 3 categories by sector.

Conclusion

Assessment boundary is appropriately defined, comprehensive in coverage of operational emissions, and consistent with regulatory requirements. Assessment boundary provides suitable foundation for comprehensive GHG quantification.

6.2 Data Quality and Input Assumptions

Compliance Finding: Compliant.

Assessment

The GHG Assessment is supported by high-quality engineering documentation from Aurecon providing detailed technical specifications, fuel consumption calculations, mechanical system designs, and energy modelling. Activity data sources are generally well-documented and traceable to authoritative sources (manufacturer datasheets, engineering calculations, industry benchmarks). Key assumptions are reasonable and aligned with data centre industry practice. Data quality meets requirements of NSW Guide Section 4.4 for transparency and replicability.

6.3 Emission Factors and Calculation Methods

Compliance Finding: Compliant.

Assessment

The GHG Assessment correctly applies NGER methodologies and NGA emission factors as required by NSW Guide Section 4.4.1. Diesel combustion emissions calculated using Method 1 (fuel-based) per NGER Measurement Determination Section 2.4. Grid electricity emissions use location-based methodology per NGER guidance with NSW grid emission factors from NGA (2024 edition). Calculation methodologies are transparent and mathematically correct.

Notable Strengths

- Current emission factors from NGA 2024 publication have been applied consistently. NGER Method 1 deemed appropriate for diesel at this stage.
- Fugitive refrigerant calculations follow NGER Measurement Determination Section 3 for equipment-based methodology.

Recommended Enhancements

Confirm specific refrigerant types and GWP values for major HVAC systems when detailed information becomes available. Document leak detection and repair program assumptions affecting annual leak rate estimates.

6.4 Forecasting and Scenario Analysis

Compliance Finding: Compliant.

Assessment

Emission projections appropriately incorporate grid decarbonisation trajectories aligned with NSW Net Zero Plan. Two scenarios (maximum capacity, operational throughput) effectively bound expected emissions.

Temporal projections to 2080 provide adequate long-term perspective. Grid emission factor decline is consistent with electricity sector modelling.

6.5 Mitigation Measures and Abatement Hierarchy

Compliance Finding: Compliant.

Assessment

Mitigation hierarchy is conceptually addressed with measures across avoid-reduce-substitute-offset categories. Technical measures (PUE 1.3, efficient cooling, low-GWP refrigerants) are appropriate and feasible. Renewable electricity procurement commitment (100% by 2030) is ambitious. HVO diesel piloting demonstrates innovation.

6.6 Compliance and Policy Alignment

Compliance Finding: Compliant.

Assessment

GHG Assessment aligns with Climate Change (Net Zero Future) Act 2023 objectives. Project emission goals consistent with State targets. NGER reporting obligations correctly identified. Safeguard Mechanism implications assessed.

6.7 Reporting Transparency and Clarity

Compliance Finding: Compliant.

Assessment

GHG Assessment is generally well-documented with clear presentation of results, transparent assumptions, and traceable calculations. Supporting documentation from Aurecon provides detailed technical foundation. Report structure follows logical sequence aligned with the NSW Guide requirements.

7. Overall Assessment and Conclusions

7.1 Strengths of the Assessment

The following points of note represent key strengths of the GHG Assessment:

- **Comprehensive Engineering Foundation:** Detailed fuel calculations, mechanical specifications, and energy modelling from Aurecon provide robust technical documentation. Fuel consumption rates verified against Cummins C2750D5BE manufacturer datasheets. Storage calculations account for 24h backup plus 2h maintenance margin.
- **Methodological Rigor:** Correct application of NGER methodologies, NGA emission factors, and GHG Protocol standards. Calculations are mathematically accurate as confirmed by independent spot-checks.
- **Long-Term Perspective:** 50-year assessment horizon appropriate for data centre infrastructure. Grid decarbonisation trajectories incorporated consistent with NSW Net Zero Plan.
- **Scenario Analysis:** Two scenarios (maximum capacity, operational throughput) effectively bound expected emissions. Conservative assumptions applied.

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- **Ambitious Mitigation Strategy:** 100% renewable electricity procurement by 2030 represents leading practice. HVO diesel piloting demonstrates innovation. PUE 1.3 target achieves industry best-practice.
- **Transparency:** Assumptions clearly documented. Activity data traceable to sources. Supporting comprehensive documentation.
- **Regulatory Alignment:** Compliance with NSW Guide for Large Emitters, NGER requirements, Climate Change (Net Zero Future) Act objectives.

7.2 Areas for Enhancement

The GHG Assessment is technically sound and demonstrates industry best-practice.

The following minor enhancements would strengthen future assessments when more detailed information is available for consideration:

1. Obtain a memorandum / report from the project team to verify that the proposed generator testing frequency and duration meet relevant standards (refer recommendation in section 8).
2. Incorporate additional detail of specific refrigerant types, GWP values, equipment-level charges, and leak detection/repair program assumptions (refer recommendation in section 8).

7.3 Final Professional Opinion

Based on a comprehensive independent expert review, the GHG Assessment prepared by E-LAB Consulting is found to be compliant with the NSW Guide for Large Emitters requirements. The assessment demonstrates substantial technical quality, methodological rigour, and regulatory compliance. Appendix A contains a comprehensive compliance matrix.

Independent spot-check calculations confirm mathematical accuracy of emission estimates. The assessment boundary is appropriately defined. Emission factors and methodologies are correctly applied. Long-term projections incorporate grid decarbonisation appropriately. Mitigation measures are technically feasible and aligned with hierarchy.

Matters identified for clarification (Section 8) represent future refinements that would enhance transparency and defensibility, and in no way represent fundamental gaps requiring reassessment. These matters do not preclude planning approval.

The GHG Assessment is recommended for acceptance as part of the Mamre Road Data Centre State Significant Development Application (SSD-92743706) submission. The assessment provides a robust foundation for understanding project GHG emissions profile and demonstrates alignment with NSW climate policy objectives through ambitious renewable energy procurement commitments.

8. Recommendations

The following clarifications and enhancements are recommended to strengthen future GHG assessments. These are not considered material deficiencies but rather refinements that would enhance regulatory defensibility.

Generator Testing (Priority: Low)

Recommendation

Project team to provide a specific memorandum / report to verify that the proposed generator testing frequency and duration meet relevant standards, e.g. AS 1851, AS/NZS 3010, and/or NFPA 110.

Rationale

A reduced testing frequency may lead to risks such as wet stacking, reduced reliability, unmet insurance requirements, and/or regulatory non-compliance.

Refrigerant Emissions (Priority: Low)

Recommendation

Provide additional detail on refrigerant emissions assumptions including:

- Specific refrigerant types for major HVAC systems (chillers, cooling towers, fan coil units) with corresponding GWP values per IPCC guidance
- Equipment-level refrigerant charge quantities (kg per unit) and total site refrigerant inventory
- Annual leak rate assumptions (%) differentiated by equipment type and age
- Leak detection and repair program specifications (inspection frequency, leak threshold for repair, recordkeeping).

Rationale

Enhanced refrigerant documentation would enable independent verification of fugitive emission calculations and demonstrate compliance with Ozone Protection and Synthetic Greenhouse Gas Management Act.

9. Limitations and Assumptions

This independent expert review is subject to the following limitations and assumptions:

- **Reliance on Provided Information:** The review relies on accuracy and completeness of information provided by proponent and consultant team. Independent verification of primary data sources (site measurements, manufacturer specifications, operational practices) has not been undertaken. Any errors or omissions in source documents would affect review conclusions.
- **Design Stage Assessment:** The review evaluates a GHG assessment prepared at concept design stage based on projected operational parameters. Actual emissions during operation may vary depending on final design details, commissioning results, operational practices adopted, maintenance effectiveness, and technology performance.
- **Future Conditions Uncertainty:** Emission projections to 2080 necessarily incorporate assumptions about future conditions including grid decarbonisation rates, technology advancements, regulatory changes, and operational practices. While projections are based on best available information, actual outcomes may differ.
- **Scope of Review:** This review focuses on technical and methodological aspects of GHG quantification. It does not address broader sustainability considerations, other environmental impacts (water, waste, biodiversity), social impacts, or economic viability assessments.
- **Verification vs. Audit Distinction:** This review constitutes a verification-level assessment consistent with planning approval processes. It is not a full greenhouse gas verification audit per ISO 14064-3, which would require on-site inspections, detailed data management system reviews, and expanded calculation sampling.
- **Professional Judgement:** Some review conclusions necessarily involve professional judgement on matters such as reasonableness of assumptions, appropriateness of methodologies, and materiality of identified issues. Alternative professional opinions may differ on subjective matters.
- **Temporal Limitations:** The review reflects best practice, and regulatory requirements current as of October 2025. Future changes in standards, methodologies, or regulatory requirements are not anticipated in this review.

Appendix A – Compliance Matrix

This compliance matrix systematically evaluates the GHG Assessment against all requirements specified in the NSW Guide for Large Emitters (2024). Each criterion is assessed as:

- C = Compliant: Requirement fully met
- PC = Partially Compliant: Requirement substantially met with minor gaps
- NC = Not Compliant: Requirement not met
- NA = Not Applicable: Requirement does not apply to this project.

Compliance Table 1: Assessment Boundary and Scope

Criterion	Review	Reviewer Comments	Evidence Reference
Project description and system boundaries clearly defined	C	Operational boundaries comprehensively defined in GHG Assessment Section 3.1. Included and excluded sources clearly stated with rationale.	GHG Assessment section 3.1
Assessment aligns with NSW Government GHG Assessment Guidance (2024)	C	Assessment structure follows NSW Guide six-step process. All required elements present.	GHG Assessment throughout
Baseline year and time horizons appropriate and justified	C	2028-2080 assessment period appropriate for 50-year operational life. Staging clearly presented.	GHG Assessment section 3.6
Assessment includes Scope 1, Scope 2, and relevant Scope 3 emissions	C	All three scopes quantified. Scope 3 category selection demonstrates materiality screening (7 of 15 categories).	GHG Assessment section 3.3, 3.5, 3.6

Compliance Table 2: Methodology and Emission Factors

Criterion	Review	Reviewer Comments	Evidence Reference
Calculation methods align with NGER, NGA Factors, and/or IPCC standards	C	NGER Method 1 correctly applied for diesel. NGA factors current (2024). IPCC values used.	GHG Assessment section 3.3, 3.5, 3.6, Fuel calculations
Emission factors are current, regionally appropriate, and documented	C	NGA 2024 factors applied.	GHG Assessment section 3.3, 3.5, 3.6, Fuel calculations
All key assumptions are transparent and reasonable	C	Major assumptions documented (PUE, load factors, fuel consumption).	GHG Assessment section 3.3, 3.5, 3.6, Energy calculations spreadsheet
Data sources and quality assurance processes described	C	Activity data sourced from Aurecon engineering calculations. Manufacturer datasheets referenced. QA approach described.	Supporting technical calculations

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Compliance Table 3: Quantification and Forecasting

Criterion	Review	Reviewer Comments	Evidence Reference
Emission totals correctly calculated for each year and scope	C	Independent spot-checks confirm mathematical accuracy. Calculations replicable. Peak year and cumulative totals presented.	GHG Assessment Tables 6-8, This review Section 5
Activity data are traceable and supported by evidence	C	Fuel consumption: Cummins datasheets. Electricity: IT capacity × hours × load factor × PUE. Traceable to sources.	Aurecon fuel calculations, Energy calculations spreadsheet
Forecast scenarios reflect credible operational parameters	C	Two scenarios (max capacity, operational throughput) bound expected range. Assumptions reasonable and conservative.	GHG Assessment section 3.3, 3.5, 3.6
Uncertainty analysis or sensitivity testing included	C	Scenarios provide sensitivity analysis for a range of potential scenarios.	GHG Assessment section 3.6.6

Compliance Table 4: Mitigation and Abatement Measures

Criterion	Review	Reviewer Comments	Evidence Reference
Hierarchy of avoidance, reduction, and offsetting applied	C	Mitigation hierarchy clearly presented with measures across all categories: avoid (optimized building), reduce (PUE 1.3, efficient systems), substitute (renewable energy, HVO), offsets for residual.	GHG Assessment section 3.6.6
Mitigation measures are technically feasible and quantified	C	Measures are feasible and well documented. Renewable energy commitment ambitious. HVO piloting innovative.	GHG Assessment section 3.3
Offsets are credible, permanent, and additional (if applicable)	C	Offset criteria appropriately specified: permanence, additionality, verification, no double-counting. High-integrity standards referenced.	GHG Assessment section 5.1-5.4
Residual emissions justified with rationale	C	Residual Scope 1 emissions from essential backup generation and fugitive leaks justified. Offsetting strategy for unavoidable emissions appropriate.	GHG Assessment section 5.1-5.4

Compliance Table 5: Policy Alignment and Compliance

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Criterion	Review	Reviewer Comments	Evidence Reference
Consistent with NSW, national, and global climate policies	C	Aligns with Climate Change (Net Zero Future) Act 2023 targets. NGER obligations identified. Safeguard Mechanism implications assessed.	GHG Assessment section 3.1-3.6
References to legislation, strategies, frameworks are correct	C	Legislative references accurate and current: Climate Change Act 2023, NGER Act 2007, POEO Act 1997, Safeguard Mechanism. NSW Net Zero Plan cited.	GHG Assessment section 3.1-3.6
Assessment addresses climate risk and transition planning	C	Emission reduction goals aligned with State net zero trajectory. Renewable energy transition pathway defined. Long-term decarbonisation considered.	GHG Assessment sections 3-6

Compliance Table 6: Reporting Quality and Transparency

Criterion	Review	Reviewer Comments	Evidence Reference
All calculations and assumptions clearly referenced and traceable	C	Major calculations traceable. Supporting documentation comprehensive.	GHG Assessment section 3.1-3.6, supporting technical calculations
Results presented clearly in tables, charts, and narratives	C	Results well-presented in tables. Graphs show temporal trends. Executive summary provides clear overview.	GHG Assessment sections 3-6
Uncertainties and limitations disclosed	C	Limitations acknowledged and uncertainty analysis has been incorporated.	GHG Assessment throughout
Executive summary accurately reflects findings	C	Executive summary comprehensive and accurate. Key results, mitigation measures, goals clearly stated.	GHG Assessment Executive Summary

Compliance Table 7: Independent Review Requirements

Criterion	Review	Reviewer Comments	Evidence Reference
Independent expert review conducted for projects >100,000 t CO ₂ -e/yr	C	Requirement noted within the GHG Assessment Report. This independent expert review fulfills NSW Guide requirement.	GHG Assessment section 3.7
Reviewer independence declared and conflicts managed	C	Independence declaration provided. No conflicts of interest. Qualified reviewer credentials documented.	This review Section 1.3
Verification spot checks performed and documented	C	Independent calculations performed for Scope 1 diesel, refrigerants, Scope 2 electricity, Scope 3 upstream.	This review Section 5

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Criterion	Review	Reviewer Comments	Evidence Reference
		Results documented with variance analysis.	
Recommendations are evidence-based and actionable	C	Recommendations clearly stated with rationale, priorities, and specific actions. Evidence-based on review findings.	This review Section 8
Overall adequacy rating and conclusion provided	C	Overall compliance rating: COMPLIANT. Recommendation for acceptance provided. Technical adequacy confirmed.	This review Section 7

Compliance Summary Statistics

Compliance Category	Count	Percentage
Compliant (C)	28	100%
Partially Compliant (PC)	0	0%
Not Compliant (NC)	0	0%
Not Applicable (NA)	0	0%
TOTAL CRITERIA ASSESSED	28	100%

Overall Compliance Finding: Compliant.

The GHG Assessment demonstrates compliance with NSW Guide for Large Emitters requirements. Of 28 criteria assessed, 28 (100%) are compliant.

Appendix B – CV of Independent Expert Reviewer

Career Overview

Marlon Kobacker is a senior sustainability advisor with over 20 years of international experience across the property and infrastructure sectors. He has held senior positions with global firms including Arup, AECOM, WSP, and Mott MacDonald.



His expertise includes GHG emissions quantification, decarbonisation strategy, and independent sustainability certification.

Selected Project Experience

Independent Expert Reviews:

- Sydney Metro Northwest – Delivery Phase Independent Sustainability Certifier for Sydney Metro of the \$8.3 billion rapid transit link including a detailed review of the net zero pathway and whole-of-life GHG emissions assessment for all stations, ancillary buildings, and rail infrastructure.
- Western Sydney International (Nancy Bird Walton) Airport – Delivery Phase Independent Sustainability Auditor for Multiplex of the \$5.3 billion airport including a detailed review of the net zero pathway and whole-of-life GHG emissions assessment.
- Central Station Redevelopment, Sydney – Delivery Phase Independent Sustainability Auditor for Laing O’Rourke of the \$1 billion airport including a detailed review of the net zero pathway and whole-of-life GHG emissions assessment.
- Barangaroo Masterplan, Sydney – Independent Sustainability Advisor at the international design competition stage for Barangaroo Delivery Authority of the \$8 billion urban renewal project including a detailed review of the carbon neutral pathway and operational GHG emissions assessment.
- Adelaide Darlington Expressway Upgrade Project Sydney – Independent Sustainability Auditor for Laing O’Rourke including a review of the whole-of-life GHG emissions assessment.
- Sydney Football Stadium Redevelopment – Independent sustainability peer review for John Holland of the \$800 million project including a detailed review of the net zero pathway and operational GHG emissions assessment.
- Crown Sydney, Barangaroo – Independent sustainability peer review for AECOM of the \$2.2 billion tower including a detailed review of the operational GHG emissions assessment.

Qualifications

Master of the Built Environment (Sustainable Development), UNSW, 2003
Bachelor of Photovoltaic and Solar Energy Engineering, UNSW, 2002
Bachelor of Arts, UNSW, 2002
Climate Active Registered Consultant
ISO 9001 Lead Auditor - Management Systems Auditing
Green Star Accredited Assessor

Expert Reference Panels and Advisory:

- Australian High Speed Rail Association – Independent Expert Panel Member for sustainability and climate change, including the climate positive pathway beyond net zero GHG emissions.
- Green Building Council of Australia – Expert Reference Panel member for the Green Star Fitouts tool due for release in 2026.
- Green Building Council of Australia – Independent Green Star Assessor conducting technical assessments for green building projects targeting Green Star certification, including the climate positive pathway to net zero emissions.
- Infrastructure Sustainability Council of Australia – Low carbon materials expert advisor for the Infrastructure Sustainability Rating Tool Materials Calculator v2 benchmarking study.

Decarbonization Policy:

- Singapore National Sustainability Policy Blueprint for 2050 – led a global team of sustainability experts to develop recommendations for the Singapore national sustainability policy framework, including a national net zero pathway for 2050.
- Singapore Housing Sustainability Guidelines – new sustainable design guidelines for the Singapore Housing and Development Board.

Decarbonization Projects – Buildings & Infrastructure:

- Infrastructure NSW Decarbonising Infrastructure Delivery Policy and Measurement Guidance – Technical Advisor to Infrastructure NSW for policy and technical guidelines for NSW infrastructure projects to calculate whole-of-life greenhouse gas emissions.

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Decarbonization Projects – Buildings & Infrastructure:

- Sydney Metro – Sustainability Advisor for the Sydney Metro Sustainability Strategy including net zero pathway in 2015 for all Sydney Metro lines (approximate value circa \$50 billion).
- Sydney Opera House – Sustainability advisor for the Climate Active certification in 2018, representing net zero greenhouse gas emissions in operation. Delivery of the 5 Star and 6 Star Green Star certifications in 2019 and 2022, respectively.
- Sunshine Coast Public Transport Project Business Case greenhouse gas emissions assessment – Whole-of-life greenhouse gas emissions assessment for a new mass-transit solution between Maroochydore and Caloundra. Compared overall GHG emissions of a rapid bus system against a light rail network.
- Sydney Metro Western Sydney Airport – Concept Design Sustainability Advisor for the new \$11 billion line comprising six new metro stations. Whole-of-life greenhouse gas assessment for all stations, ancillary buildings and rail infrastructure.
- Sydney Metro West – Concept Design Sustainability Advisor for the new \$30 billion line comprising 10 new metro stations. Whole-of-life greenhouse gas assessment for all stations, ancillary buildings and rail infrastructure.
- Sydney City & Southwest – Reference Design Sustainability Advisor for the new \$20 billion line comprising 19 new metro stations including whole-of-life greenhouse gas assessment.
- Sustainable Buildings Research Centre, University of Wollongong – Sustainable Design Advisor for the first Living Building Certified project in Australia. The building achieved net zero energy, carbon and water performance.
- EarthRights International Centre for Justice, Chiang Mai, Thailand – Sustainable Design Advisor for the net zero carbon, LEED Platinum certified commercial and educational facility in Chiang Mai.
- Parramatta Light Rail Stage 1 Supply, Operate & Maintain Contract – Delivery phase Sustainability Advisor for the \$2.9 billion, 12km light rail project. Whole-of-life greenhouse gas assessment.
- Sydney CBD & Southeast Light Rail – Bid Phase Sustainability Advisor for the \$3 billion, 12km light rail project. Whole-of-life greenhouse gas assessment.
- Asia Land & Sea Resorts, Flores, Indonesia – Sustainable Design Advisor for 6 eco-resorts targeting net zero carbon emissions in operation, LEED Platinum ratings and a 40% upfront carbon reduction.

Data Centre Projects:

- NEXTDC S1 Data Centre, Sydney – sustainable design advisor with a focus on Power Usage Effectiveness and Water Usage Effectiveness.
- Microsoft Auckland Data Centre, New Zealand – sustainable design advisor for a regional data centre targeting a LEED Gold rating with world-leading Power Usage Effectiveness and Water Usage Effectiveness via onsite renewable energy and rainwater capture.

Conference Speaking Appointments:

- UN Association of Australia (UNAA) SDG 11 Focus Forum, 2016 – Sydney Forum facilitator focusing on opportunities within Australia to support Sustainable Development Goal 11 – focused on cities.
- 4th Annual Vertical Cities Conference, 2015, Singapore – delivered a presentation on ‘Delivering Better Returns Through Whole of Life Financial Analysis’, outlining the long-term benefits of considering life cycle costs and environmental impacts during design to inform decision-making.
- 4th Annual International Green Building Conference, Singapore, 2012 – presented “Minimising the Costs of Green Rated Buildings”, questioning the common perception that such buildings cost more to build, and techniques to minimise costs and add value through early project involvement.
- Inaugural South African Green Building Convention & Exhibition, Cape Town, 2008 – presented “Delivering Green Rated Buildings: The Pain and the Glory” providing insight into certification using rating tools, such as Green Star or LEED.
- Inaugural Israeli Green Building Conference, Tel Aviv, Israel, 2010 – presented “Westfield Sydney – World Leadership in Sustainable Refurbishment”.
- Inaugural International Green Building Conference, Belgrade, Serbia, 2011 – presented “Minimising the Cost of Green Rated Buildings”, focusing on increased rental returns and asset value of global LEED, BREEAM and Green Star certified buildings.
- 7th International Conference on Green & Energy Efficient Building & New Technologies & Products Expo, Beijing, China, 2011 – presented “International Green Building Case Studies” focusing on LEED certified projects across Asia, Australia and the Middle East.

Appendix C – References

This appendix lists all standards, guidance documents, regulations, and technical references cited in this independent expert review.

Regulatory and Legislative References

- Climate Change (Net Zero Future) Act 2023 (NSW). NSW Parliament. Sydney, Australia.
- Environmental Planning and Assessment Act 1979 (NSW). NSW Parliament. Sydney, Australia.
- Environmental Planning and Assessment Regulation 2021 (NSW). NSW Parliament. Sydney, Australia.
- National Greenhouse and Energy Reporting Act 2007 (Cth). Commonwealth Parliament. Canberra, Australia.
- National Greenhouse and Energy Reporting (Measurement) Determination 2008 (F2024C00960, consolidated version October 2024). Commonwealth of Australia. Canberra, Australia.
- National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 (F2024C00698, consolidated version August 2024). Commonwealth of Australia. Canberra, Australia.
- Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 (Cth). Commonwealth Parliament. Canberra, Australia.
- Protection of the Environment Operations Act 1997 (NSW). NSW Parliament. Sydney, Australia.

Standards and Guidance Documents

- Standards Australia (2014). AS 2776-2014: Diesel engines - Reciprocating internal combustion engines driven alternating current generating sets. Standards Australia Limited, Sydney, Australia.
- Australian Government, Department of Climate Change, Energy, the Environment and Water (2024): National Greenhouse Accounts Factors: Australian National Greenhouse Accounts. Commonwealth of Australia, Canberra. Published July 2024. Accessed 27 October 2025 from <https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-factors-2024>
- Clean Energy Regulator (2024). Corporate Emissions and Energy Data 2022-23: Published Data. Commonwealth of Australia, Canberra. Accessed 27 October 2025 from <https://www.cleanenergyregulator.gov.au/NGER/Published-data>
- Clean Energy Regulator (2024). Methods and Measurement Criteria Guideline (Version 5.0, October 2024). Commonwealth of Australia, Canberra. Accessed 27 October 2025 from <https://www.cleanenergyregulator.gov.au/NGER/About-the-National-Greenhouse-and-Energy-Reporting-scheme/Publications/methods-and-measurement-criteria-guideline>
- Clean Energy Regulator (2024). Voluntary Market-Based Scope 2 Emissions Guideline (Version 2.0, March 2024). Commonwealth of Australia, Canberra. Accessed 27 October 2025 from <https://www.cleanenergyregulator.gov.au/NGER/About-the-National-Greenhouse-and-Energy-Reporting-scheme/Publications/scope-2-emissions-guideline>
- Climate Active (2023). Climate Active Carbon Neutral Standard for Organisations (Version 1.3, December 2023). Commonwealth of Australia, Department of Climate Change, Energy,

the Environment and Water, Canberra. Accessed 27 October 2025 from <https://www.climateactive.org.au/resources>

- Commonwealth Carbon Credits (Carbon Farming Initiative) Act (2011)
- Commonwealth of Australia (2011). Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth). Canberra, Australia.
- GHG Protocol (2004). A Corporate Accounting and Reporting Standard (Revised Edition, March 2004). World Resources Institute and World Business Council for Sustainable Development, Washington DC, USA and Geneva, Switzerland. ISBN 1-56973-568-9.
- GHG Protocol (2011). Corporate Value Chain (Scope 3) Accounting and Reporting Standard. World Resources Institute and World Business Council for Sustainable Development, Washington DC, USA and Geneva, Switzerland. ISBN 978-1-56973-772-9.
- GHG Protocol (2013). Technical Guidance for Calculating Scope 3 Emissions: Supplement to the Corporate Value Chain (Scope 3) Accounting and Reporting Standard (Version 1.0). World Resources Institute and World Business Council for Sustainable Development, Washington DC, USA and Geneva, Switzerland.
- Intergovernmental Panel on Climate Change (2019). 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement). IPCC, Geneva, Switzerland. Accessed 27 October 2025 from <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>
- International Organization for Standardization (2018). ISO 14064-1:2018 Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals. ISO, Geneva, Switzerland.
- International Organization for Standardization (2019). ISO 14064-3:2019 Greenhouse gases – Part 3: Specification with guidance for the verification and validation of greenhouse gas statements. ISO, Geneva, Switzerland.
- NSW Environment Protection Authority (2024). NSW Guide for Large Emitters: Greenhouse Gas Assessment Guideline for State Significant Projects (Version 1.0, March 2024). NSW Government, Sydney, Australia. Accessed 27 October 2025 from <https://www.epa.nsw.gov.au/publications-and-resources/greenhouse-gas-assessment-guideline>
- NSW Government (2022). NSW Net Zero Plan Stage 1: 2020-2030. NSW Treasury and Department of Planning and Environment, Sydney, Australia. ISBN 978-1-922766-48-7. Accessed 27 October 2025 from <https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/reaching-net-zero-emissions/net-zero-plan>

Project-Specific Technical Documents

- Aurecon Australasia Pty Ltd (2025). Concept Design Report Revision 2. Dated 14 October 2025.
- Aurecon Australasia Pty Ltd (2025). Fuel Calculations Revision 2. Dated 14 October 2025.
- Aurecon Australasia Pty Ltd (2025). Site Fuel Demand Memorandum Revision 2. Dated 30 September 2025.
- Aurecon Australasia Pty Ltd (2025). Mechanical Services Calculations Revision 1. Dated 14 October 2025.
- Aurecon Australasia Pty Ltd (2025). Generator Intake E-Mist Water Calculation Revision 1. Dated 30 September 2025.

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- Cummins Inc. (2024). C2750D5BE Generator Set Datasheet: Standby Rating 2,200 kW_e at 50 Hz. Cummins Power Generation, Minneapolis, Minnesota, USA. Specifications include fuel consumption 539.9 L/h at 100% load, 453.5 L/h at 75% load.
- E-LAB Consulting Pty Ltd (2025). Greenhouse Gas Assessment Report – Mamre Road Data Centre Project (Document No. ELAB_706752_Mamre_Rd_GHG_Assessment_005, Revision 005 DRAFT). Prepared for Plan Project Management Pty Ltd. Sydney, Australia. Dated 1 December 2025.
- E-LAB Consulting Pty Ltd (2025). Ecologically Sustainable Design Report – Mamre Road Data Centre Project (Document No. ELAB_706752_Mamre_Rd_ESD_Report_005, Revision 005). Prepared for Plan Project Management Pty Ltd. Sydney, Australia. Dated 1 December 2025.
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Appendix D – Glossary of Terms

This glossary defines technical terms, acronyms, and concepts used throughout this report.

ACC: Air-Cooled Chiller configuration

Additionality: Principle that offset projects create emission reductions that would not have occurred without offset financing

Baseline: Reference point for measuring emission reductions, typically business-as-usual scenario without mitigation

Carbon Offset: Tradable certificate representing emission reduction or removal of one tonne CO₂-e

CER: Clean Energy Regulator - Commonwealth regulator administering NGER and Safeguard Mechanism

CO₂-e: Carbon dioxide equivalent - standard unit expressing impact of all GHGs relative to CO₂

DCC Rating: Duty Continuous / Duty Standby Continuous - generator rating for backup power applications

Embodied Carbon: GHG emissions from material production, transport, and construction processes

Fugitive Emissions: Intentional or unintentional releases of GHGs, typically refrigerant leakage

GHG: Greenhouse Gas - gases that trap heat in atmosphere (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆)

GWP: Global Warming Potential - heat-trapping capacity of GHG relative to CO₂ over 100 years

HDC: High Density Cooling configuration

HVO: Hydrotreated Vegetable Oil - renewable diesel fuel from waste oils and fats

IPCC: Intergovernmental Panel on Climate Change - scientific body on climate science

LGC: Large-scale Generation Certificate - tradable renewable energy certificate under RET

Location-Based: Scope 2 accounting method using grid-average emission factors

Market-Based: Scope 2 accounting method reflecting contractual energy purchases

Mitigation Hierarchy: Prioritization framework: Avoid → Reduce → Substitute → Offset

NGA: National Greenhouse Accounts - Australian government emission factors and methods

NGER: National Greenhouse and Energy Reporting - Commonwealth reporting scheme

ODP: Ozone Depletion Potential - capacity to destroy stratospheric ozone

PPA: Power Purchase Agreement - long-term contract for renewable energy

PUE: Power Usage Effectiveness - ratio of total facility power to IT power (1.0 = perfect)

REC: Renewable Energy Certificate - generic term for tradable renewable attributes

Safeguard Mechanism: Commonwealth policy limiting emissions from large industrial facilities

Scope 1: Direct GHG emissions from owned/controlled sources (diesel combustion, fugitives)

Scope 2: Indirect emissions from purchased electricity, heat, steam, cooling

Scope 3: Other indirect emissions from value chain (supply, transport, waste, etc.)

SSDA: State Significant Development Application - NSW major project approval process

t CO₂-e: Tonnes of carbon dioxide equivalent - metric tonne = 1,000 kg

vPPA: Virtual Power Purchase Agreement - financial instrument supporting renewable generation.

