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MOOREBANK INTERMODAL PRECINCT – EAST PRECINCT

Best Practice Progress Review 2025

11 JULY 2025

Incorporating Hyder

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Best Practice Progress Review 2025

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REVISIONS

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001	10/07/25	Draft for Client Review	SB	HT
002	11/07/2025	Final for issue	SB	HT

ACRONYMS AND DEFINITIONS

Term	Explanation
AS	Australian Standard
ARA	Australasian Railway Association
ARRM	Australian Rail Risk Model
BITRE	Bureau of Infrastructure and Transport Research Economics
BPR (2017)	MPE Stage 1 (SSD 6766) Best Practice Review (Report #013 September 2017)
BPR (2021)	MPE Stage 1 (SSD 6766) Best Practice Review (Report #014 June 2021)
BPR (2022)	MPE Stage 1 (SSD 6766) Best Practice Review (Report #015 June 2022)
BPR (2023)	MPE Stage 1 (SSD 6766) Best Practice Review (Report #016 June 2023)
BPR (2024)	MPE Stage 1 (SSD 6766) Best Practice Review (Report #017 July 2024)
BPR (2024)	MPE Stage 1 (SSD 6766) Best Practice Review (Report #018 July 2025). This report
CO	Carbon monoxide
CO_2	Carbon dioxide
CoA	Condition of Approval
RISSB CoP	Rail Industry Safety and Standards Board – Code of Practice
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPHI	Department of Planning, Housing and Infrastructure
DPE	Department of Planning and Environment (now DPHI)
EIS	Environmental Impact Statement
EPA	Environment Protection Authority – Australia
EPL	Environmental Protection License
ESR Group	LOGOS was fully acquired by ESR Group Limited in July 2024
EU	European Union
Facility	The MPE Concept (MP10_0193), MPE Stage 1 (SSD 6766) and MPE Stage 2 (SSD 7628 as modified) Project, including the operation of the IMEX terminal, warehousing and distribution facilities. A rail link is included as part MPE Stage 1 (SSD 6766) and connects the Facility to the SSFL.
FORG	Freight on Rail Group
IMEX	Import-Export Terminal Facility • Truck processing, holding and loading areas – entrance and exit from Moorebank Avenue • Rail loading and container storage areas – installation of four rail sidings with adjacent container storage area serviced by manual handling equipment initially and overhead gantry cranes progressively • Administration facility and associated car parking – light vehicle access from Moorebank Avenue.

Term	Explanation
IMT	MPE Stage 1 Site including the construction of the following key components together comprising the intermodal terminal (IMT): • Truck processing and loading areas • Rail loading and container storage areas • Administration facility and associated car parking • Rail Link.
LOGOS	LOGOS Property (see ESR Group)
MPE	Moorebank Precinct East
MIC	Moorebank Intermodal Company
MIP	Moorebank Intermodal Precinct
MLP	Moorebank Logistics Park
MPW	Moorebank Precinct West
NIC	National Intermodal Corporation
NMHC	Non-methane hydrocarbons
NRMM	Non-road mobile machinery
NOx	Oxides of nitrogen
NO_2	Nitrogen dioxide
OAQMP	Operational Air Quality Management Plan
POAQMP	Precinct Operational Air Quality Management Plan
PM	Particulate matter
Qube	Qube Holdings Limited
RISSB	Rail Industry Safety and Standards Board
SSD	State significant development
SIMTA	Sydney Intermodal Terminal Alliance
THC	Total hydrocarbon
US EPA	United States Environmental Protection Authority

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1 INTRODUCTION

This Best Practice Progress Review (the Report) has been prepared in accordance with the requirements of the Best Practice Review (Report #013 September 2017) [referenced as BPR (2017)] which was prepared by Arcadis to satisfy the Moorebank Precinct East (MPE) Stage 1 State Significant Development (SSD) 6766 Condition of Consent (CoC) G6.

The BPR (2017) stated that a progress review against the objectives and targets of available best practice on an annual basis (for a notional period of up to seven years from operation) would be undertaken to ensure that available best practice benchmarks are current, relevant and achievable.

1.1 Background

The Moorebank Logistic Park (MLP) is an integral component of the Freight, Ports and Transport strategies of both the NSW and Commonwealth governments to help manage the challenges of an expected tripling of freight volumes at Port Botany from 2019 to 2031.

The MLP was previously operated by the Sydney Intermodal Terminal Alliance (SIMTA), which until December 2021 was wholly owned by Qube Holdings Limited (Qube). Logos Property (LOGOS), a leading Asia Pacific logistics specialist, acquired SIMTA and the construction and operation of the MLP following Qube's sale of the project in December 2021. Qube however, still retains full ownership and operation of the Import-Export Terminal Facility (IMEX) Rail Terminal and have a majority ownership of the future Interstate Rail Terminal. LOGOS was fully acquired by ESR Group in July 2024 and now has overall responsibility the Moorebank Intermodal Precinct (MIP) [1]. MIP comprises the MIP East Precinct and MIP West Precinct, located east and west of Moorebank Avenue.

On 24 February 2022, the Federal Government announced that Moorebank Intermodal Company (MIC) would have its mandate expanded and would become known as the National Intermodal Corporation (NIC)[2]. The new Corporation will play a key role in supporting the delivery of interconnected intermodal terminals in Melbourne and Brisbane, to support the completion of the Federal Government's $14.5 billion Inland Rail project.

Qube, ESR Group and NIC will all have equity interests in the Interstate Rail Terminal's ownership and a new joint development entity will be responsible for the terminal's future operations.

The MIP aims to streamline the freight logistics supply chain from port to store, deliver savings to businesses and consumers, and help service the rapidly growing demand for imported goods in south-west Sydney. The MIP is located approximately 27 kilometres (km) south-west of the Sydney Central Business District and approximately 26 km west of Port Botany within the Liverpool Local Government Area.

ESR Group manages MIP East Precinct as a whole, with specific responsibility for warehouse and distribution facilities. Qube Logistics still maintains responsibility for operation of the IMEX and the Rail Link.

MIP East Precinct (Figure 1-1) comprises the IMEX and associated Rail Link (the subject of this Report) and Warehouses 1, 3, 4, 5, 6, 7a and 7b. The IMEX, Rail Link and warehouses are currently

[1] With LOGOS purchasing the MLP, the MLP will now be referred to herein as Moorebank Intermodal Precinct (MIP).

[2] NIC is incorporated under *the Commonwealth Corporations Act 2001* and is a prescribed Government Business Enterprise (GBE) operating under the *Public Governance, Performance and Accountability Act 2013* (PGPA Act) and PGPA Rule 2014. NIC is wholly owned by the Australian Government, represented by the Minister for Minister for Infrastructure, Transport, Regional Development and Local Government and the Minister for Finance as the two Shareholder Ministers.

operational, while Warehouse 2 (Area 5) and the freight village (Area 6) are the last of the areas to be constructed.

The MIP West Precinct (SSD 5066 and SSD 7709), which is mostly still currently under construction, with only Warehouses 6 and 7 operational. MPW is not included in this Report.

Since Warehouses 6 and 7 at the MIP West Precinct commenced operations, a Precinct Operational Air Quality Management Plan (POAQMP) was prepared and approved by the Department of Planning Housing and Infrastructure (DPHI). The POAQMP covers the operational activities being undertaken across both the MIP East Precinct and the MIP West Precinct. The POAQMP was prepared in accordance with the MPW Stage 2 SSD 7709 CoC B47A and supersedes the MIP East Precinct OAQMP.

1.2 Purpose and structure

This Report has been prepared to satisfy the Best Practice Progress Review for emission technologies for locomotives (Rail Link and IMEX) as identified in Table 4-5 of the MIP POAQMP and Section 4.2.3 of the MIP East Precinct Stage 1 (SSD 6766) BPR (2017).

The BPR (2017), required as part of SSD 6766 CoA G6(a), was approved in 2017 and identified the need to undertake a Best Practice Progress Review annually for up to seven years from commencement of operation.

The purpose of this Report is to:

- Review progress against the objectives and targets of available best practice referenced in the BPR (2017) (Section 2)
- Review progress against the objectives and targets of available best practice referenced in the Best Practice Progress Reviews (BPPR 2021 to BPPR 2024). This section also includes any updates since the BPPR 2024 (Section 3)
- Summarise best practice emission objectives and targets of available best practice to ensure that available best practice benchmarks are current, relevant and achievable (Section 4)
- Provide recommendations on how the Facility will implement available best practice technologies, as they relate to available upgrade / repower options (Section 5)
- Fulfil the fifth annual Best Practice Progress Review since commencement of operation.

In accordance with Table 4-5 of the MIP POAQMP, this Best Practice Progress Review will be submitted to the DPHI (previously DPE), and the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for information.

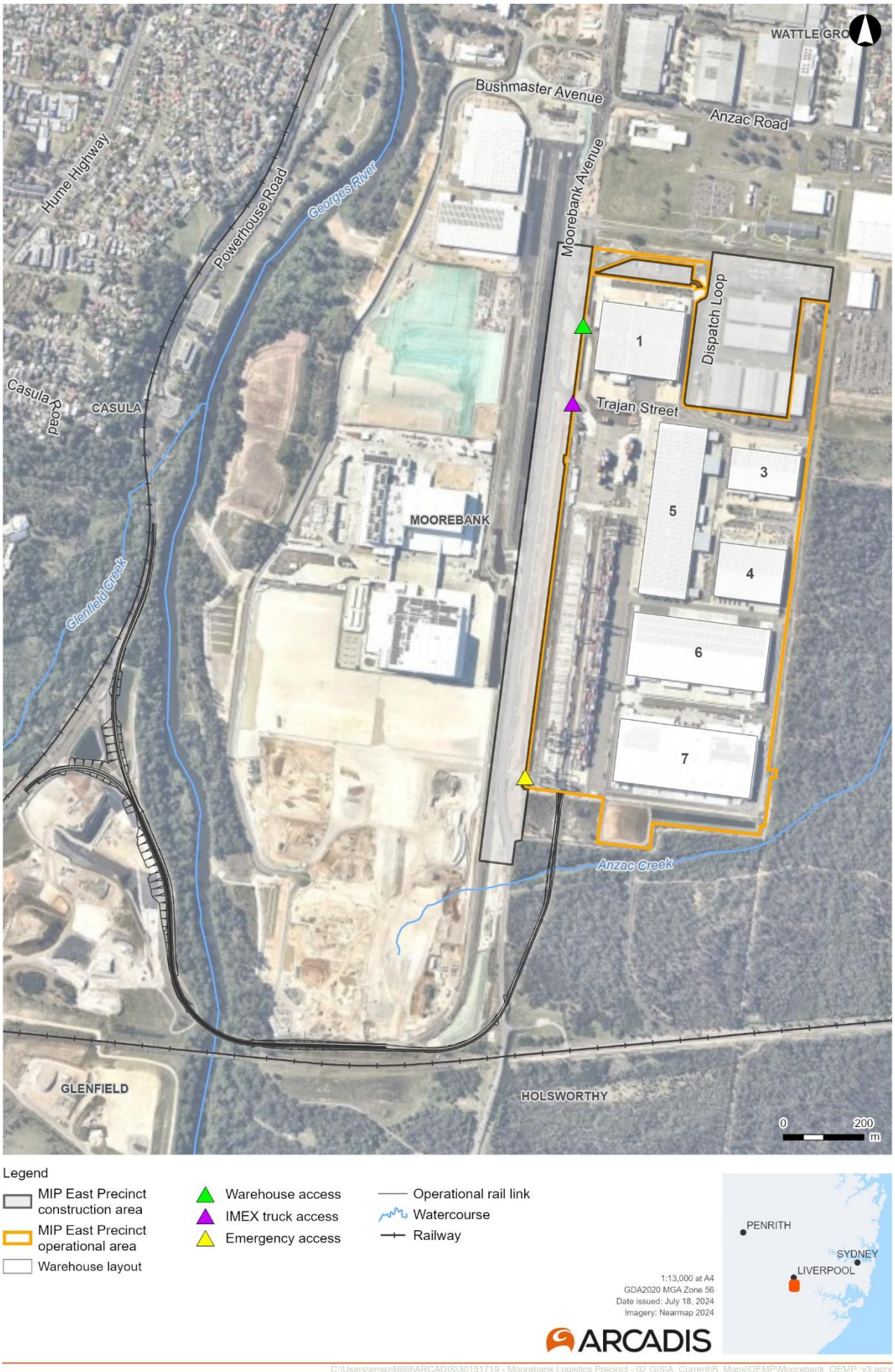

Figure 1-1: Moorebank Intermodal Precinct - East Precinct overview

2 BEST PRACTICE REVIEW (BPR, 2017)

Qube is required and committed to operate the IMEX and Rail Link as a non-discriminatory open access terminal. That means the IMEX terminal could be accessed by any rail operator within the existing fleet of port shuttle locomotives and wagons used by the industry. Therefore, while Qube cannot directly influence the technology used by the existing fleet, they can impose reasonable and feasible performance benchmarks for air emissions for port shuttle locomotives and wagons that enter the IMEX terminal.

Following consultation with the Environmental Protection Authority (EPA) and Transport for NSW, and based on an understanding of industry best practice, the benchmarks in Table 2-1 were established for the IMEX and Rail Link (as per the BPR, 2017 and the MIP POAQMP). These benchmarks have been established until an industry standard, or guideline has been recognised, at which time the relevant standard or guideline, including associated timeframes, would apply. Until then, Qube would restrict port shuttle locomotives, that do not meet the following air emissions standards from entering the MIP East Precinct IMEX terminal (Table 2-1).

Table 2-1: Locomotive emission benchmarks

Locomotive type	Standard	Periodic improvements	Ultimate outcome
Existing locomotives	Operate with diesel particulate emissions less than 0.30 grams per kilowatt hour (g/kWh)	Any overhauls of existing locomotives after the commencement of operations of the IMEX terminal would need to comply	All existing locomotives to comply within 7 years of operation of the IMEX terminal
New locomotives	Operate with diesel particulate emissions less than 0.27 g/kWh and oxides of nitrogen (NOx) emissions of less than 7.37 g/kWh.	Any new locomotives ordered after the commencement of operations of the IMEX terminal would need to comply	N/A
New locomotives	Operate with diesel particulate emissions less than 0.13 g/kWh and NOx emissions of less than 7.37 g/kWh.	Any new locomotives ordered after 5 years of the commencement of operations of the IMEX terminal would need to comply	N/A

It is Qube's intention to continuously improve, through benchmarking, the environmental performance of port shuttle locomotives which use the IMEX terminal. This continuous improvement will be based on industry benchmarking to ensure both a non-discriminatory open access arrangement and best practice can be achieved.

The benchmarking process will provide reasonable time for the rail operator to ensure that their fleet intended to use the IMEX terminal meet the imposed standard that will be set by Qube as the minimum benchmark, from a published date.

The following section provides a summary of the available best practice benchmarks up to 2025.

3 BEST PRACTICE REVIEWS 2021 TO 2024

A summary of the available best practice technology and best practice benchmarks are discussed below. The summary has been developed through a desktop analysis of world-wide best practice and is discussed in the context of the BPR (2017).

The BPR (2021) provides the last significant update since the BPR (2017) report was prepared and issued. BPR (2022 to 2024) and this current review (BPR 2025) have only identified minor updates and changes in the best practice technology and best practice benchmarks, which have been reflected below.

3.1 Air emissions

3.1.1 Rail Industry Safety and Standards Board

The Rail Industry Safety and Standards Board (RISSB) is an accredited Standards Development Organisation in Australia responsible for the development and management of rail industry standards, rules, codes of practice and guidelines. The standards, codes of practice, rules and guidelines published by RISSB form the Australian Code of Practice (CoP) for rail operated services in Australia.

Since the development of the BPR (2017), RISSB has released the first recommended practices: *Code of Practice (CoP) Management of Locomotive Exhaust Emissions (RISSB, November 2018)* for the management and improvement of exhaust emissions of diesel freight locomotives in the Australian railway industry.

The revised version, dated 16 November 2018, has been included in Appendix A. The CoP provides weighted average emission requirements as shown in Table 3-1.

Table 3-1: Weighted average emissions for locomotives (adapted from RISSB, 2018)

Locomotive type	PM [a] Emissions (g/kWh) [b]	Comment
New locomotives	0.27	USA tier(c) 2 UIC II level[3]
Upgraded locomotives	0.30	USA tier 0+ level [d]
Pre-owned (imported) locos new [e]	0.27	Pre-owned locomotive refers to a locomotive previously operated overseas and ordered after the effective date of importation for use in Australia. If the locomotive previously operated outside Australia was manufactured after 1 January 2010 or had covered less than 50,000 km at the date of importation, it shall be considered a new locomotive for purposes of the CoP and shall meet the standards required of a new locomotive.
Pre-owned (imported) locos other	0.30	

Note: [a] PM – particulate matter

[b] To convert g/kWh to g/bhph multiply by 1.341, to convert g/bhph to g/kWh multiply by 0.7457

[c] USA Tiered emission standards are discussed in more detail in Section 3.1.3

[d] This is in reference the 2008 US EPA emissions standards

[e] a locomotive ordered after the effective date of this CoP including orders for already manufactured but not used new locomotives

[3] UIC - The International Union of Railways is a Paris-based international railway organisation comprising 82 active member countries, 80 associate member countries and 35 affiliate members. Australia is an affiliate member of the UIC. The UIC established its own locomotive emission standards, which are binding to member railways but not affiliated members. (Environ Australia, for NSW EPA, March 2013)

The CoP does not explicitly state oxides of nitrogen (NOx) or carbon monoxide (CO) targets, however notes "*Consistent with meeting the emission standards for PM [particulate matter] specified above, and minimising emissions of GHG [greenhouse gas], operators should endeavour to minimise emissions of NOx*."

In addition to emission requirements, the CoP identifies that:

- Operators shall undertake upgrades on existing locomotives, which are not capability compliant[4], by whatever method, as required to meet the requirements, at the first major overhaul after the effective date, and before the due date unless essential components to undertake such an update are not available. The due date is defined as 10 years after the effective date (i.e. December 2028).
- Equivalent or better ways of achieving the required emissions outcomes may be possible. It states that for this reason, compliance with the CoP is not mandatory, providing that any other method used provides an equivalent or improved emissions outcome than is defined in the CoP.
- Improved technology may become available over the review period and that, to remain relevant, it is likely that the CoP will be updated at intervals less than the review period. The review period is generally four years. However, at the time of writing this report, no further versions of the CoP are available for review.
- Locomotive operators are required to provide annual reporting updates to the reporting organisation (identified as the Australasian Railway Association (ARA) at the time of the CoP release). The CoP requires the number of:
  - New locomotives purchased in the prior calendar year and compliance with the CoP
  - Non-compliant locomotives, including those receiving a major overhaul, receiving an upgrade kit, for which no kit was available and reasons why any non-compliant locomotive receiving a major overhaul, and capable of being upgraded did not receive an upgrade.
- Locomotives ordered after the effective date shall be certified as meeting the requirements in Table 3-1 having full regard for planned usage, Australian weather conditions, modifications to meet Australian Standards, and other factors deemed to likely affect the level of locomotive emissions.
- A non-compliant locomotive which at due date has not been upgraded to meet emissions standards in Table 3-1 shall not be in breach of CoP:
  - If the locomotive has received a major overhaul prior to due date but no parts were available to upgrade its emission standard; or
  - The locomotive has not received an overhaul, but it will be scrapped within five years after the due date; or
  - In each year after the due date, the locomotive will not exceed the threshold usage.
  - If in 12 consecutive months the due date the locomotive does extend the threshold usage, it shall be upgraded to comply with emission standards no later than 12 months after this exceedance.

The release of the RISSB CoP (RISSB, November 2018) represents a best practice Australian standard that will be subject to ongoing review and updates. Whilst it is noted that this CoP was not established at the time of the BPR (2017), the current locomotive emission benchmarks (Table 2-1) are considered consistent with the CoP standards. Amendments to the CoP will continue to be reviewed annually at the time of future annual best practice reviews. There has been no update to the RISSB CoP since 2018 as of May 2025.

[4] Capability compliant: a locomotive which meets or exceeds the relevant standards in Table 2-1.

3.1.2 EPA Environmental Protection Licences – Rolling Stock

The EPA has been working with train rolling stock operators to reduce air and noise impacts on the community. On 5 August 2020, following extensive consultation with stakeholders, the EPA issued new Environmental Protection Licences (EPL) to rolling stock operators (EPA, 2020). The MIP EPL 21361 was issued to Qube Logistics (Rail) Pty Ltd on 5 August 2020.

The new licences, inclusive of the MIP EPL (21361) details:

- Operating conditions and pollution studies relating to idling
- Require new locomotives in NSW to comply with air emission limits
- Monitoring and reporting requirements to allow the progress of the rail industry in reducing emissions to be determined over time.

A review of EPL 21361 identified the following key requirements as shown in Table 3-2.

Table 3-2: Rolling Stock EPL Air Emission Requirements under EPL21361

Locomotive type	Requirement
New locomotives	**L4.1 - Air emission limit for new classes of locomotive** a) From the date of issue of this licence, any New Locomotive Class that is to be operated on a Licenced Rail Network must comply with the US EPA Tier 2 line-haul cycle weighted average exhaust emission limit for particulate matter (PM) of 0.27g/kWh. b) The licensee must provide written confirmation of compliance with the emission limit in a form nominated by the EPA fourteen days prior to operating any new class of locomotive. c) Where the class designation of locomotives of an Existing Locomotive Class has changed (e.g. transfer of ownership), those locomotives are not considered to be a New Locomotive Class and Condition L4.1(a) does not apply to that Locomotive class. d) If the licensee intends to operate locomotives of an Existing Locomotive Class pursuant to Condition L4.1(c), the licensee must, at least seven days before operating the locomotives, advise the EPA of the new class designation of the locomotives.
	L4.2 - Compliance with the air emission limit specified in Condition L4.1(a) must be supported by air emissions type testing of the class of locomotive or engine in accordance with Condition L4.3.
	L4.3 - Air emissions type testing methods a) Air emissions type testing for the purposes of Condition L4.2 must be carried out using equipment and procedures in accordance with either United States Code of Federal Regulations Title 40 part 1033 (CFR 1033), ISO 8178 or EC Regulation 595. The calculation of the cycle-weighted average PM emissions must be undertaken using the weightings in the US EPA line haul duty cycle specified in US CFR 1033. b) Type testing of the locomotive or engine may be satisfied by evidence provided by the locomotive engine original equipment manufacturer or the supplier of an engine emission upgrade kit. c) Where type testing of one engine or locomotive class indicates compliance with Condition L4.1(a), such testing will be accepted as evidence of compliance with Condition L4.1(a) of all locomotives fitted with an identically configured engine upon submission to the EPA of evidence of that compliance in a form nominated by the EPA.

Locomotive type	Requirement
All	**Section 5 - Reporting** The licensee must prepare a report which describes the actions and practices undertaken by the licensee to prevent or minimise noise and air emissions, and impacts on sensitive receivers, from locomotives idling on any Licensed Rail Network. *Note: This report may be used to develop a Pollution Reduction Program to further investigate potential improvements to current actions and practices and develop a management plan to minimise the impacts of idling where appropriate and as requested by the EPA*

There have been two (2) variations to the EPL since the EPL 21361 was issued in August 2020. One in August 2023, and one in May 2025. These variations were initiated by the EPA to standardise conditions across EPL's for licensees carrying out rolling stock activities, update administrative changes and to update reporting requirements. The updates in May 2025 were largely administrative and have not been covered in this report.

The following are the variations made to the EPL in August 2023:

- The removal of U1 Pollution Study - Operation Report – Idling
- The removal of U2 Pollution Study - Operation Report - Horn use
- The removal of U3 Pollution Study - Operation Report – Braking, bunching and stretching
- Capitalisation of 'power assembly', 'manufactured', and 'freshly manufactured' in major engine overhaul definition in E1 Dictionary.
- Addition of Condition M5.3(f) stating *"the noise testing required by Condition M5.3a must be undertaken within 6 months after each Major Engine Overhaul."*
- Addition of test to Condition O7.2 so that the condition applies only to locomotives that may be used as lead locomotive.

The current locomotive emission benchmarks (Table 2-1 of this BPR) are consistent with the above guidelines.

Qube also provides the annual return in September each year reporting on the status of compliance against the EPL requirements.

3.1.3 US EPA's tiered emissions standards

The most commonly referenced international emissions standard is the US EPA's tiered emissions standards for new locomotives and re-manufactured locomotives.

Table 3-3 shows the US-EPA emission standards for key pollutants relating to line-haul locomotives as identified in the Code of Federal Regulations (CFR) *Title 40: Protection of Environment, Part 1033- Control of Emissions from Locomotives,* dated 30 June 2008[5].

[5] eCFR :: 40 CFR Part 1033 -- Control of Emissions from Locomotives

Table 3-3: US-EPA Tiered Standards for line-haul locomotives

Year of original manufacture	Tier of standards (1)	PM (g/bhp-hr) (2)	HC (g/hp-hr)	NOx (g/bhp-hr)	CO (g/bhp-hr)
1973-1992	Tier 0	0.22	1.00	8.0	5.0
1993-2004	Tier 1	0.22	0.55	7.4	2.2
2005-2011	Tier 2	0.10	0.30	5.5	1.5
2012-2014	Tier 3	0.10	0.30	5.5	1.5
2015 or later	Tier 4	0.03	0.14	1.3	1.5

Note: (1) Refers to US Code of Federal Regulations; *Title 40: Protection of Environment, Part 1033-Control of Emissions from Locomotives* for specific footnotes regarding exceptions, standards and conditions relevant to each Tier.

(2) g/bhp-hr is grams per brake horsepower per hour

Transitions to the standards specified in Table 3-3 are as follows:

- Tier 0 and 1 standards apply for new locomotives beginning 1 January 2010, except as specified in the interim provisions[6]. The Tier 0 and 1 standards specified in Table 3-4 below only apply to earlier model years.
- Tier 2 standards apply for new locomotives beginning 1 January 2013. Similar to above, standards specified in Table 3-4 apply for earlier model years.
- Tier 3 and 4 standards apply for their respective locomotive engine years e.g., Tier 3 between 2012 and 2014 and Tier 4 in 2015 to current.

Table 3-4: US-EPA Original Standards for Tier 0, Tier 1 and Tier 2 line-haul locomotives

Year of original manufacture	Tier of standards (1)	NOx (g/bhp-hr) (2)	PM - Primary (g/bhp-hr)	PM-alternate (3) (g/bhp-hr)	HC (g/hp-hr)	CO (g/bhp-hr)
1973-1992	Tier 0	9.5	0.60	0.30	1.00	5.0
1993-2004	Tier 1	7.4	0.45	0.22	0.55	2.2
2005-2011	Tier 2	5.5	0.20	0.10	0.30	1.5

Note: (1) Refers to US Code of Federal Regulations; *Title 40: Protection of Environment, Part 1033-Control of Emissions from Locomotives* for specific footnotes regarding exceptions, standards and conditions relevant to each Tier.

(2) g/bhp-hr is grams per brake horsepower per hour

(3) Locomotives certified to the alternate PM standards are also subject to alternate carbon monoxide (CO) standards of 10.0 for the line-haul cycle and 12.0 for the switch cycle

A review of the US standards was undertaken during the initial BPR (2017), as at the time no Australian CoP or best practice standard had been established. Subsequent reviews were also undertaken for each BPR since 2017. As the RISSB CoP is in place and is considered best practice in Australia, the US EPA standards are only stated here for reference.

On 12 April 2023, the US-EPA announced a proposal that, among other things, would amend US-EPA's regulations relating to the Clean Air Act's (US) prohibition against states applying emission standards to new locomotives or new engines used in locomotives. This pre-emption regulation was adopted in 1998 and prevents most non-federal regulation of locomotives and engines used in locomotives for a period equivalent to 133 percent of the useful life.

[6] eCFR :: 40 CFR 1033.150 -- Interim provisions.

The US-EPA is proposing amendments in part because the agency is concerned these pre-emption regulations adopted in 1998 may no longer be appropriate. The proposal is for a new and stronger set of greenhouse gas standards for heavy-duty vehicles for model years 2027 through 2032, building from the “Phase 2” greenhouse gas standards, including for locomotives, established in 2016. These “Phase 3” greenhouse gas standards would significantly reduce carbon emissions from heavy-duty vehicles and, through the increased use of zero-emission vehicle technology projected in the proposal, would also reduce emissions of smog and soot-forming pollutants and help to address the challenges of global climate change and air pollution in communities near major roadways.

This rule implements a policy change to no longer categorically pre-empt certain State regulations of non-new locomotives and engines. This aligns with the plain text of the Clean Air Act (CAA) and better achieving the legislative intent of providing for exclusive Federal regulation of new locomotives and new locomotive engines, while preserving the ability of American States to adopt and enforce certain State standards regulating non-new locomotives and engines. The ruling has been effective from 8 December 2023.

3.1.4 European Standards

In the European Union, emissions of NOx, total hydrocarbon (THC), non-methane hydrocarbons (NMHC), CO and PM are regulated for most vehicle types and are guided by the European Environment Agency[7].

The term non-road mobile machinery (NRMM) is a term used in the European emission standards to control emissions of engines that are not used primarily on public roadways. This definition includes off-road vehicles as well as railway vehicles. European emissions are regulated by the NRMM Regulation as of 1 January 2017. There have been multiple amendments and supporting documentation to the NRMM Regulation since 2017, with the latest being on 30 August 2022. However, European standards for non-road diesel engines generally harmonise with the US EPA standards and comprise gradually stringent tiers known as Stage I–V standards.

These are summarised below.

- Stage I/II was part of the 1997 directive (Directive 97/68/EC). It was implemented in two stages with Stage I implemented in 1999 and Stage II implemented between 2001 and 2004.
- In 2004, the European Parliament adopted Stage III/IV standards. The Stage III standards were further divided into Stage III A and III B and were phased in between 2006 and 2013.
- Stage IV standards are enforced from 2014.
- Stage V standards are phased-in from 2018 with full enforcement from 2021.

The first stage to apply to railway is Stage IIIA as railway engines have been excluded from the scope of earlier NRMM directives. EC Directive 2004/26/EC distinguishes between engines used in railcars and locomotives, and provides phased limits for NO_2, PM, CO and hydrocarbons known as Stage III A and III B. Stage IV are specified for some NRMM equipment but are still under discussion for engines used on railways.

As the RISSB CoP is in place and is considered best practice in Australia, the RISSB CoP will be the overarching document when reviewing and updating the Best Practice Progress Review reports over the next reporting periods. To ensure best practice, the RISSB CoP will also be re-evaluated against international documents as they are updated. Due to locomotives having long lifespans, these regulations are often updated when there are new technological advancements.

[7] https://www.eea.europa.eu/publications/emep-eea-guidebook-2023

3.1.5 Emission performance of the existing Australian fleet

A review of the emission performance of the existing Australia fleet is not within the scope of this Report. The most recent detailed review of emissions of the Australian fleet was completed by ENVIRON in 2013 and was summarised in the (BPR, 2017). A desktop review since then has not identified any new detailed emissions performance of the existing Australian fleet.

It is noted that Abmarc, a transport and emissions consultancy, produced a report in 2016 for the NSW EPA studying diesel locomotive fuel efficiency and emissions on two of the most commonly used locomotives in Australia. The aim of this project was to establish the baseline exhaust emissions and fuel consumption of General Electric (GE) powered NR121 and 9317 locomotives owned and operated by Pacific National. This project followed on from the fuel efficiency and emissions testing study of Electro-Motive Diesel (EMD) powered locomotives upgraded with emissions kits ("Diesel Locomotive Emissions Upgrade Kit Demonstration Project") that NSW EPA conducted in collaboration with locomotive operator, Pacific National, in 2015. EMD and GE locomotives represent together over 90% of locomotives operating in NSW. The locomotive testing was conducted in general accordance with USA CFR 1065, 1033 and 92, and occurred in July 2016 in the UGL facility in Broadmeadow, NSW.

This project found that both the tested locomotives (NR121 and 9317) achieved emission results below the US-EPA Tier 0+ requirements for particulate matter (PM), THC, and CO. NOX emissions, however, exceeded the Tier 0+ standard by 55% on NR121 locomotive and 13% on 9317.

In addition, the Bureau of Infrastructure and Transport Research Economics (BITRE), within the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications released a statistical report in 2021 that provides an overview of freight, urban and non-urban passenger rail[8].

The report analyses traffic levels, the provision of infrastructure and rolling stock, and railway performance, including a brief overview of environmental performance. It noted that the rail industry's full fuel cycle CO_2 equivalent[9] emissions have been increasing each year from 2007 to 2019.

3.1.6 Emission control technology for upgrade / repower options in Australia

Options to improve air emissions from in-service locomotives include fleet upgrades, repowering, fuel efficiency improvements and retrofitting of after-treatment systems. These have been previously described in the MPE Stage 1 EIS and continue to be relevant in BPR 2024.

It should be noted that Australia's largest rail freight company is currently retrofitting one of their 4000-class diesel locomotives into a battery powered locomotive, becoming a zero-emission capable freight locomotive. The engine upgrade and retrofit are expected to be completed in 2025, with trials expected in late 2025, with further extended range trials expected in 2026. This may set a precedent for future rail transport in Australia and may allow retrofitting for many current diesel-powered locomotives.

[8] https://www.bitre.gov.au/sites/default/files/documents/train_008.pdf

[9] A carbon dioxide equivalent or CO_2 equivalent, (CO_2-eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

3.1.7 Updates since BPR 2024

The following reports released since the last BPR, provide clarity for emissions reductions in the rail and locomotive industry in both Australia and around the world. While the reports do not contain legally binding content or set technical criteria and targets, they highlight areas where greater priority is needed to ensure reduction targets are met and advancements in emissions reductions are made.

US EPA – Action Plan for Rail Energy and Emissions Innovation – December 2024

The U.S. EPA's *Action Plan for Rail Energy and Emissions Innovation* outlines a national strategy to decarbonise the rail sector as part of broader efforts to achieve net-zero emissions by 2050. Developed with the Department of Energy, Department of Transportation, and Housing and Urban Development (HUD), the plan targets greenhouse gas reductions in Class I freight rail, air pollution cuts in rail yards and short-line operations, and increased access to low-emission passenger rail. It promotes electrification, low- and zero-emission technologies, and modal shifts from higher-emission freight transport to rail. The plan adopts a systems-based approach, recognising the interconnectedness of transport modes, and stresses collaboration through public-private partnerships. Its success depends on coordinated implementation and sustained innovation across government and industry to ensure environmental, economic, and social benefits. The plan remains a central policy tool for advancing sustainable rail in the United States.

RISSB's Work Plan 2024-2025

RISSB's 2024–2025 Work Plan focuses on delivering projects that support industry priorities, innovation, and national rail reforms. Key initiatives include developing and revising standards to enhance interoperability, harmonisation, safety, productivity, and sustainability. The plan emphasises increased adoption and implementation of RISSB products, with projects selected based on feedback from members, stakeholders, and governments, as well as insights from the Australian Rail Risk Model (ARRM). By fostering collaboration and aligning with national interests, RISSB aims to promote a more unified and efficient rail industry.

RISSB's 2024–2030 Strategic Plan

RISSB's 2024–2030 Strategic Plan prioritises supporting the decarbonisation of Australia's rail industry. The plan recognises the rail sector's potential to contribute significantly to national climate goals and outlines RISSB's role in enabling this transition through the development and implementation of standards, codes of practice, and guidance that promote low-emission technologies and practices. It focuses on harmonising approaches to sustainability, encouraging the uptake of energy-efficient rollingstock, supporting alternative fuels and electrification, and fostering consistent industry-wide methods for measuring and reducing emissions. By partnering with government and industry stakeholders, RISSB aims to ensure that its standards and tools, reflect climate priorities and actively drive emissions reduction across the rail network.

***The critical path to decarbonise Australia's Rolling Stock* in July 2024 - The Australian Railway Association (ARA) and GHD**

This report outlines a strategic roadmap to transition the rail sector in Australia toward net-zero emissions. The report highlights that approximately half of Australia's diesel-powered rollingstock is due for replacement between 2030 and 2050, presenting a pivotal opportunity to adopt low and zero-emission technologies. Given that traction energy accounts for about 90% of rail's operational emissions, the report emphasises the urgency of coordinated action to develop and implement sustainable alternatives. Key recommendations include establishing a shared national strategy, investing in research and pilot projects, planning for enabling infrastructure, ensuring renewable energy and fuel supply, and building skills and supply chain capabilities. The success of this transition hinges on immediate, collaborative efforts between industry and government to avoid locking in high-emission assets and to align with Australia's net-zero targets.

4 BEST AVAILABLE TECHNOLOGY AND CURRENT INDUSTRY BENCHMARK AS OF MAY 2025

This BPR 2025 was reviewed against the most recent standards and practices as outlined above and any additional resources that have become available since the BPR 2024. No significant changes have occurred since the report published in 2024.

The following updates have been made:

- Further details have been included to provide updates to the Projects operational management (EPL)
- Progress of international and Australian progress towards zero emissions locomotives, with action plans and strategic pathways delivered.

Although the reports produced since the last BPR are not legally enforceable and do not establish specific technical standards or targets, they identify key areas that require increased focus to support progress toward meeting emissions reduction goals.

Based on this, the best practice will remain consistent with those already in place since 2022, where the most significant updates were stated.

5 FLEET REVIEW

In addition to the above-mentioned air standards, Qube is advised to complete a detailed review of the existing fleet utilising the IMEX terminal and for any other locomotives potentially using the terminal.

This review can be used to develop a matrix for the fleet that intend to use the IMEX terminal and to compare this fleet to the wider locomotive fleet. The aim would be to identify the implementation of best practice performance in emissions reduction and a road map for ongoing review and improvement, in addition to the recommendations identified throughout this document.

Appendix B details the locomotives and locomotive container wagons that have been using the IMEX terminal since operation in 2020. It is noted that the terminal has not been running at full capacity since operation commenced.

Under Section 3.8 of the RISSB CoP, it is recommended that the operator of locomotives should secure agreements of the owners to comply with the RISSB CoP.

6 CONCLUSION

This BPR 2025 has been prepared following the fifth year of MIP operations in accordance with the requirements of the BPR (2017) prepared by Arcadis to satisfy the MPE Stage 1 SSD 6766 CoC G6, and subsequently the MIP POAQMP.

Under the MPE Stage 1 Project approval, IMEX would be operated as a non-discriminatory open access terminal, meaning that the IMEX terminal can be accessed by any rail operator within the existing fleet of port shuttle locomotives used by the industry. On this basis, while Qube cannot directly control the technology used by the existing fleet, they can influence it through imposition of minimum performance expectations for air emissions for port shuttle locomotives that enter the IMEX terminal. These current standards are included in the MIP POAQMP and also provided in Table 2-1 of this BPR 2025. Qube would restrict port shuttle locomotives that do not meet the air emissions standards from entering the MIP IMEX terminal.

This BPR 2025 summarises the international and Australian emission standards and best practice technology available to reduce air emissions from locomotives. Since the BPR (2017), RISSB has released a CoP for the management and improvement of exhaust emissions of diesel freight locomotives in the Australian railway industry. This release represents a best practice Australian standard that will be subject to ongoing review and updates. Whilst it is noted that this CoP was not established at the time of the BPR (2017), the current locomotive emission standards (Table 2-1) are considered consistent with the CoP standards.

Amendments to the CoP will continue to be reviewed annually during preparation of the annual best practice reviews to ensure that available best practice benchmarks are current, relevant and achievable.

BPR 2025 includes minor updates to the Projects EPL since BPR 2024 and summarises international and Australian progress towards zero emissions locomotives, which have been outlined in action plans and strategic pathways since BPR 2024. This BPR 2025 has been prepared to ensure the current best practice standards and technology for locomotives both in Australia and internationally have been reviewed and updated where relevant.

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APPENDIX A RISSB CODE OF PRACTICE

Document control

Document identification

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Publication version	Effective date	Reason for and extent of change(s)
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Contents

1 Introduction

1.1 Purpose

This Code of Practice describes recommended practices for the management and improvement of exhaust emissions of diesel freight locomotives in the Australian railway industry.

Diesel locomotives create several emissions with adverse effects on the environment or human health, including diesel particulates (PM), oxides of nitrogen (NOx) and greenhouse gases (GHG).

In the Australian context, PM and GHG emissions are considered higher priority issues than NOx emissions. This Code of Practice seeks to address these Australian environmental considerations through a balanced approach to these competing emissions outcomes. As such this Code of Practice has reflected the broader priorities in addressing locomotive emissions.

It is recognised that equivalent or better ways of achieving the required emissions outcomes may be possible. For this reason, compliance with this Code of Practice is not mandatory, providing that any other method used provides an equivalent or improved emissions outcome than is defined in this Code of Practice.

1.2 Scope

This Code of Practice covers all diesel locomotives used for the haulage of freight in Australia, including both for hire and reward, and those used as part of the production process.

It is not applicable to:

- heritage locomotives not used for any commercial freight tasks;
- locomotives used solely for the haulage of passengers;
- other on-rail diesel engines e.g. those used in track maintenance machinery.

1.3 Definitions

Capability compliant: a locomotive which meets or exceeds the relevant standards in Table 1.

Certification: means a formal statement from a supplier (or where applicable an operator) of the emission level from a locomotive confirming that equipment (either an engine, locomotive, or parts installed for reducing locomotive emissions) has been tested and is compliant with the relevant emission level in this Code of Practice. Certification of one engine as compliant shall be accepted as evidence of compliance by all locomotives similarly engined and configured. ("type testing").

Testing data or certification of an engine or kit undertaken overseas shall be accepted as evidence of performance in Australia unless such use is expressly forbidden by the supplier.

Compliant maintenance: means the configuration, operation and maintenance of components and systems affecting locomotive emissions as directed by the original equipment manufacturer (OEM), or in the case of an upgrade, the kit supplier, or as modified by changes to best practice, so that emissions conform to the certification provided.

Due date: is 10 years after the effective date.

Duty cycle: The amount of time a locomotive spends in each throttle notch setting ("notch").

Effective date: is 1 December 2018 being the first day of the first month falling more than 12 months after the publication of this Code of Practice.

Existing locomotive: a locomotive either ordered for supply to or in service in Australia at the effective date.

FROEPG (Freight Rail Operators' Environmental Policy Group): is a group open to all freight rail operators in Australia and comprising the majority of such operators. It was formed in 2012, with the endorsement of RISSB and the Australasian Railway Association (ARA), with the purpose to address environmental matters resulting from rail freight operations.

Major overhaul: is a scheduled power assembly change out, component change out or other planned maintenance requiring replacement of 75% or more of the pistons and cylinder liners of the engine. A major overhaul will not include unscheduled maintenance to replace these components due to unforeseen failure of engine component(s) prior to scheduled maintenance.

New locomotive: a locomotive ordered after the effective date of this Code of Practice including orders for already manufactured but not used new locomotives.

PM: particulate matter present in the exhaust emissions of diesel locomotives.

Pre-owned locomotive: a locomotive previously operated overseas and ordered after the effective date for importation and use in Australia. If the locomotive previously operated outside Australia was manufactured after 1 January 2010 or had covered less than 50 000 km at the date of importation, it shall be considered a new locomotive for the purposes of this Code of Practice and shall meet the standards required of a new locomotive.

Reporting organisation: means that organisation nominated by the industry which is independent of any operator subject to this Code of Practice, which will publish annual data on the emissions performance of the freight industry as described in Section 2.7 of the Code. At the effective date the reporting body was the Australasian Railway Association (ARA).

Review period: means the maximum period between formal reviews of this Code of Practice commencing from the publication of this Code of Practice. The review period is four years.

Short term: means a period of less than 5 years.

Should: The use of the word 'should' indicates a recommendation.

Technical body: means that organisation nominated by the industry which is independent of any operator subject to this Code of Practice, which prepares and publishes the data on locomotive PM emissions by engine model required in Table 2 of this Code of Practice. FROEPG may by majority vote of the FROEPG members act as the Technical Body if no other body is nominated.

Testing: means the measurement and determination of the weighted average of a locomotive's PM emissions using the processes and methodology outlined in Section 3.1 of this Code of Practice.

Threshold usage: means 50,000 km/annum and is the maximum level of annual locomotive usage, at which the relevant provisions in Section 2.5.c shall apply.

Upgrade kit: means a package of parts generally comprising enhanced pistons, injectors and other components which when fitted to an existing locomotive will reduce PM emission levels to at or below levels specified in this Code of Practice.

Upgraded locomotive: an existing locomotive upgraded after the effective date, to meet the standard below.

Weighted average emissions: The weighted average emissions ("emissions") shall be the emissions of PM g/ kWh developed from the emissions in each notch weighted by the duty cycle. Calculation of weighted average emissions should preferably use the AAR main line duty cycle

2 Improvement by application of mandatory locomotive standards

2.1 Weighted average emissions

Table 1 - Required weighted average emission level line haul duty cycle

Locomotive type	PM Emissions g/kWh	Comment
New Locomotives	0.27	
Upgraded locomotives	0.30	USA tier 0+ level
Pre-owned (imported) locos “new”	0.27	Refer above for definition of a “new“ pre-owned locomotive
Pre-owned (imported) locos other	0.30	

2.2 Purchase of new locomotives

Locomotives ordered after the effective date shall be certified as meeting the requirements in Table 1 having full regard for planned usage, Australian weather conditions, modifications to meet Australian Standards, and other factors deemed likely to affect the level of locomotive emissions.

This requirement shall be waived if the operator provides documented evidence that:

(a) no locomotive with this emission standard meeting the operator’s specific operational and network requirements was commercially available in Australia at the time of purchase; and

(b) the locomotive purchased provides the highest available standard meeting these operational and network requirements.

2.3 Upgrading of existing locomotives

Existing locomotives found to be non-compliant shall be upgraded to meet the requirements in Table 1 in this Code of Practice, generally through fitting of an upgrade kit.

An operator may at their discretion upgrade an existing locomotive through other engine modification works which can be demonstrated to improve emissions sufficiently to satisfy this upgrading requirement, subject to certification.

Operators shall undertake this upgrade on existing locomotives, which are not capability compliant, by whatever method, as required to meet the requirements of Table 1, at the first major overhaul after the effective date, and before the due date unless essential components to undertake such an update are not available.

2.4 Emission /fuel usage optimisation

Changing the engine injection timing and other settings alters the mix of emissions between the three key emission types. Action to reduce fuel usage and emission of GHG may therefore have the effect of increasing emissions of PM and/or NOx.

Operators may alter the engine timing and other settings of their new or upgraded locomotives to optimise fuel usage and GHG emissions, provided that certification of compliance at this new configuration is supplied.

Existing locomotives which have not been upgraded may be similarly optimised without the need to provide evidence from testing.

2.5 Locomotives not compliant by the due date

A non-compliant locomotive which at the due date has not been upgraded to meet the emission levels in Table 1 shall not be in breach of this Code of Practice if:

(a) the locomotive has received a major overhaul prior to the due date, but no parts were available to upgrade its emission standard (as above); or

(b) the locomotive has not received an overhaul, but it will be scrapped within five years after the due date; or

(c) in each year after the due date, the locomotive will not exceed the threshold usage (the operator shall supply data to confirm compliance). If in any 12 consecutive months after the due date the locomotive does exceed the threshold usage, it shall be upgraded to comply with Table 1 of this Code of Practice not later than 12 months after this exceedance.

Operators using this provision should avoid operating these locomotives in or around urban areas or population centres.

2.6 Review of emission standards for new locomotives

It is recognised that over the review period of this Code of Practice that improved technology may become available. It is anticipated that, to remain relevant, it is likely that this Code of Practice will be updated at intervals less than the review period; in particular, the content of Table 1 and Table 2.

2.7 Reporting

Operators shall report to the reporting organisation within two months after the end of each calendar year (or part calendar year in the first year) after the effective date:

(a) the number of new locomotives purchased in the prior calendar year;

(b) of that number, those that meet the standard;

(c) that meet a lesser but best available standard as addressed in Section 2.3.

Operators shall also report at this time the number of non-compliant locomotives:

(a) receiving a major overhaul as defined above;

(b) receiving an upgrade kit;

(c) for which no kit was available; and

(d) reasons why any non-compliant locomotive receiving a major overhaul, and capable of being upgraded did not receive an upgrade.

(e) disposals of locomotives net of any purchase of non-compliant locomotives

The reporting body shall publish this data per operator within four months of the end of each calendar year.

3 General actions to reduce emissions

3.1 Testing

Equipment and the procedures used to measure emissions for certification in Australia shall comply with one or more of US EPA 1065, EC 595 and Regulation 49. The calculation of the weighted average PM emissions shall be undertaken using the weightings in the US EPA line haul duty cycle.

3.2 Certification

Certification of either an engine, locomotive, or parts installed for reducing locomotive emissions shall confirm that it has been tested in accordance with Section 3.1 and is compliant with the relevant emission level in Table 1 of this Code of Practice. Certification of one engine as compliant shall be accepted as evidence of compliance by all locomotives similarly engined and configured. (Type testing).

Certification of capability compliance for new and existing locomotives in the compliant configuration and set up specified by the purchaser and accepted by the supplier shall be satisfied by evidence of certification by the OEM, or for upgraded locomotives, certification by the provider of an emission upgrade kit, and shall be the responsibility of the supplier.

Certification/testing undertaken overseas will be acceptable if meeting either US EPA or EU UIC requirements. However, any Australian testing will take precedence over such overseas information.

If no certification, either from independent sources or local testing, is available for an engine it shall be deemed as non-compliant.

3.3 Maintenance Equipment

The OEM/kit supplier shall provide the information required for compliant maintenance. Variation of the locomotive set-up outside these conditions shall require retesting of the locomotive emission levels.

3.4 Geographic usage

Prior to the due date, no operational restrictions shall be placed on new, existing or upgraded locomotives as a result of this Code of Practice.

After the due date, operators shall take all reasonable steps to minimise human exposure to the use of non-capability compliant locomotives.

3.4.1 Reduction through improved operating practices

Operators should take actions to reduce emissions from in-service use, especially in urban areas or adjacent to centres of population, through steps such as:

(a) running locomotives "dead" when not required for operating conditions;

(b) use of software to optimise engine loadings in multi loco consists;

(c) installing idling management equipment such as engine stop/start or similar systems;

(d) use of crew advisory systems to optimise conservation of momentum; and

(e) crew training.

3.5 Network owners/operators to facilitate emission reduction

Network owners/operators should consider maximising available opportunities to reduce locomotive emissions exacerbated through network conditions. For example, to increase network velocity, reduce delays, and enable conservation of momentum.

3.6 Actions to reduce emissions of NOx

Consistent with meeting the emission standards for PM specified above, and minimising emissions of GHG, operators should endeavour to minimise emissions of NOx.

3.7 Change of ownership

Where either all or part of an operator's fleet, or beneficial control of the operator, is sold, the improvement obligations under this Code of Practice shall continue.

3.8 Locomotive not owned by the operator

Some locomotives are owned by parties other than the operator. This includes locomotives under financing arrangements, and those owned by a customer, who contracts with the operator to provide haulage services to the owner using these locomotives.

Responsibility for compliance of these locomotives with this Code of Practice shall rest with the operator. The operator shall, where necessary, secure any agreements from the Owner needed to allow the Operator to achieve this compliance.

This requirement shall not apply to short term commercial leases of locomotives, or those maintained by the lessor, where responsibility for compliance shall reside with the locomotive owner.

4 Data for determining compliance

Table 2 data below, unless provided by an OEM or testing, provides guidance only for determining compliance of existing locomotives. Operators should establish compliance in accordance with Section 3

Table 2 - Weighted average PM emissions/kWh for engine models operating in the Australian rail freight industry (including non-hire and reward operations)

Engine Model	PM Emissions g/kWh	Source
Alco 12-251C	N/A	No
Alco 12-251CE	N/A	No
Alco 12-251E	N/A	No
Alco 6-251	N/A	No
Alco 6-251B	N/A	No
Cummins QSK19	0.134	O.E.M
Cummins QSK78-18	0.134	O.E.M
EMD 12-567C	N/A	No

Engine Model	PM Emissions g/kWh	Source
EMD 12-645C	N/A	No
EMD 12-645E3B	0.386	O.E.M
EMD 12-645E3C	N/A	No
EMD 12-645F3B	0.389	O.E.M
EMD 12-710-G3B-ES (Upgraded Tier 0+)	<0.268	O.E.M
EMD 12-710G3	0.386	O.E.M
EMD 12-710G3A	0.386	O.E.M
EMD 12-710G3B-EC	N/A	O.E.M[3]
EMD 12-710G3B-ES2	0.386	O.E.M
EMD 12-645E	N/A	O.E.M[3]
EMD 16-567BC	0.386	O.E.M
EMD 16-567C	0.447	O.E.M
EMD 16-645E	0.447	O.E.M
EMD 16-645E3	N/A	O.E.M[3]
EMD 16-645E3B	N/A	O.E.M[3]
EMD 16-645E3C	0.447	O.E.M
EMD 16-645E3C (Tier 0+ kit already fitted)	<0.268	O.E.M
EMD 16-645F3	0.452	O.E.M
EMD 16-645F3B	0.386	O.E.M
EMD 16-710 SLAC (SD90MAC)	N/A	O.E.M[3]
EMD 16-710G3	0.386	O.E.M
EMD 16-710G3A	0.386	O.E.M
EMD 16-710G3A SD60 JWAC	N/A	O.E.M[3]
EMD 16-710G3A (Tier 0+)	<0.268	O.E.M
EMD 16-710G3A-EC	0.366	O.E.M
EMD 16-710G3A-EFI	0.366	O.E.M
EMD 16-710G3B-ES	N/A	No
EMD 16-710G3B SD70M JWAC	N/A	O.E.M[3]
EMD 16-710G3C-ES	N/A	No
EMD 16-710G3C SD75M JWAC	N/A	O.E.M[3]
EMD 16-710G3C-ES2	<0.241	O.E.M
EMD 16-710G3C-T1	0.3	O.E.M

Engine Model	PM Emissions g/kWh	Source
EMD 16-710G3C-T3	<0.107	O.E.M
EMD 20-645E3	0.463	O.E.M
EMD 6-567C	0.389	O.E.M
EMD 8-567C	0.389	O.E.M
EMD 8-645E	0.389	O.E.M
EMD 8-710G3B	N/A	No
EMD 8-710G3B (Tier 0+)	0.10	O.E.M
EMD16-645E3B	0.447	O.E.M
EMD16-710G3A EFI	0.366	O.E.M
English Electric 12CSVT	N/A	No
English Electric 6CSRKT	N/A	No
English Electric 8SRKT	N/A	No
GE 7FDL12 EFI 2800	N/A	O.E.M[1]
GE 7FDL12 MUI	N/A	O.E.M[1]
GE 7FDL16 Dash8 EFI	N/A	O.E.M[1]
GE 7FDL16 Dash8 MUI	N/A	O.E.M[1]
GE 7FDL16-C40ACi-AU	0.134	O.E.M
GE 7FDL16-C44ACi-AU	0.134	O.E.M
GE 7FDL16-Dash9 EFI	0.19	O.E.M
GE 7FDL16-Dash9 NR	0.134	O.E.M
GE EVO12-ES44ACi-AU	0.134	O.E.M
GE EVO12-ES44DCi-AU	0.134	O.E.M
GE P616-PH37ACi-AU	0.134	O.E.M[2]
MTU-20V4000R43	0.134	O.E.M
MTU-20V4000R43L	0.134	O.E.M

Notes:

1. No PM test data is available for these engine types according to Section 3.1 of the RISSB Locomotive Emissions CoP
2. GE P616-PH37ACi-AU PM is an estimate for US EPA LH Duty Cycle based upon EU3a certification test results.
3. Performance varies with specific configuration and some models are compliant; refer to O.E.M or Supplier for details
4. Further data affecting entries in this Table may be issued from time to time

RISSB

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APPENDIX B LOCOMOTIVE FLEET USING THE IMEX TERMINAL SINCE OPERATIONS BEGAN

Locomotive types using MPE since operation. It should be noted that these locomotives may not be using MIP East Precinct each year but have been identified at least on one occasion using IMEX since operation commenced.

Locomotive type	Weight (t)	Power (kW)	Engine
QL	134	3,364	GE 7FDL-16EFI
14 Class*	-	-	-
CM	132	2,312	Cummins QSK78
GL	132	2,379	GE 7FDL
CF	134	3,364	GE 7FDL-16EFI
QBX	134	3,000	MTU Freidrichshafen 20V4000R43L
RL	132	2,610	EMD 645F3B
VL	130	2,237	EMD 645E3C
QE	134	3356	EMD 16-710G3C-ES

*Data not available

In addition to the above locomotives, locomotive container wagons in use at MPE include SQEF, SQDY, CQMY, CQPY, CQNY, SQSY, CQBY, LQAY, CQGY, SQEY, CQKY, CQZY, QB, JHR, and QDEM.