

INDUSTRY PROFILE

Rail



ANZSIC 4710 Rail Freight Transport
ANZSIC 4720 Rail Passenger Transport

Report Prepared July 2023

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Overview

- This industry profile covers the rail sector as classified under the of ANZSIC Division 1 category Transport, Postal and Warehousing. Relevant ANZSCO Industry Groups are:
 - 4710 Rail Freight Transport – in WA this is Heavy Haul rail moving, for example, iron ore, minerals and wheat.
 - 4720 Rail Passenger Transport – in WA this is the Public Transport Authority. This is characterised by METRONET with electric trains powered from overhead cables.
- The WA rail sector is unique inside Australia for three factors:
 - private companies own significant rail networks. For example FMG, BHP and Rio Tinto alone operate over 2000 kilometres of remote Heavy Haul rail
 - newly constructed METRONET and remote Heavy Haul rail make WA a world leader in autonomous trains and electronic signalling. This generates world leadership in infrastructure advances forming integrated logistics systems. For example integration now of rail with Pilbara Ports and potentially road – rail – port integration at Westport, Kwinana.
 - Decisions affecting WA Heavy Haul rail create a strategic effect on Australia due to the value of WA iron ore and wheat exports to the Australian economy.

1. Industry background

- **Strategic value of Pilbara iron ore rail.** WA accounted for 38% of global iron ore supply in 2022. The iron ore industry was 29% of the WA gross state product in 2021-22 and 55% by value of WA export of goods. Iron ore accounted for 85% of WA royalty revenue and 25% of general revenue in 2021-22. Port Hedland exported 61% of WA iron ore sales volume in 2021-22 followed by Cape Lambert (19%), Dampier (14%) and all other WA ports (5%). This strategic export is built on the operational efforts of the rail workforce. Pilbara mines connect to port using state government and private-owned railways. For example FMG, BHP and Rio Tinto alone operate over 2000 kilometres of remote rail network in WA. These remote WA rail networks lead the world in autonomous train and automatic signalling technology. This creates demand for rail workers with high level skills.¹
- **Global demand for WA wheat.** WA wheat is 50% of Australia's total production. 95% is exported predominantly to Asia and the Middle East. Wheat is the major grain crop produced in WA. Wheat is 65% of annual grain production generating \$2-3 billion annually for the State economy. Wheat production occurs mainly across the WA Wheatbelt and Great Southern. Wheat is moved by Heavy Haul rail on approximately 5,500 km of standard, narrow and dual-gauge rail infrastructure in the southern half of the state. Harvest collect points range from Midwest WA to the Goldfields and Wheatbelt regions through to the South West and Great Southern. The war in Ukraine has boosted global demand for WA wheat. The 2022-2023 WA harvest set a new record. This is the second successive record harvest beating the 2021-2022 harvest. That harvest is still being moved by rail from storage to port in 2023. Trains are being cancelled due to the shortage of Train Drivers.
- **WA rail and the global supply chain.** WA Heavy haul rail joins the global supply chain via ports. Global exports are subject to surges and declines in the world commodity markets. World events affect prices and Australian exports. For example the war in Ukraine affects wheat and liquid natural gas production and supply. COVID-19 has affected Brazil Iron Ore delivery. The March 2022 Chinese snap lockdown for zero-Covid policy closed the port of Shanghai.
- **Construction of METRONET.** The rail Construction phase of the 15 METRONET projects and the current construction of remote freight rail networks for iron ore export in the Pilbara require specific rail construction occupations that move between railway construction sites. These occupations are mobile. The higher level rail engineers cannot be trained in WA. Rail construction technicians support the engineers. The required occupations change as projects mature from construction into the maintenance and operations phases of the 15 year project life cycle. The extra 72 km of METRONET passenger network under construction will require up to 30 electric train drivers.
- **National domestic freight movements.** Road (66%) and rail (32%) complete the majority of national domestic freight movements by tonne. Shipping contributes 2% and air 1%. Shipping contributes more in terms of tonne-km.² An East-West corridor study in 2007 showed 18.3 billion tonne-km of freight with rail transporting 58%, road 29% and shipping 13%. The East-West corridor is the main route for domestic containerised cargo with 70-90% moved by rail. Bulk cargo is primarily transported by rail. The annual rail freight task is approximately 414 billion tonne-km. Nationally 65% of the annual rail freight task is iron ore and 22% coal. The remaining rail freight is grains, sugar and fertilisers (6%) and non-bulk product (6%).
- **Regulatory and licensing bodies.** The Industry safety regulator is the Office of the National Rail Safety Regulator. ONRSR is the independent body corporate established under the Rail Safety National Law to enforce safe rail operations, promote and improve national rail safety.³

- **Location of rail workforce.** The geographic location of workforce is on the rail network. Passenger rail is concentrated in the Perth Metropolitan Area. Heavy Haul Freight rail is concentrated in the Pilbara with Heavy Haul of wheat in the Wheatbelt, Mid-West, Great Southern and Goldfields-Esperance regions.

2. Workforce opportunities and challenges

2.1 WA Heavy Haul rail

- **Heavy Haul freight rail.** The world leadership of WA in the design, construction, operation and maintenance of remote Heavy Haul rail creates opportunity for leadership in workforce development. WA has an estimated 2,639 kilometres of railway in the Pilbara region. This Heavy Haul rail transports iron ore from mine to port. The remote rail networks are maintained, upgraded and expanded to connect new mine sites to port. In addition there is approximately 5,500 km of standard, narrow and dual-gauge freight rail infrastructure in the southern half of the state shipping grain. This ranges from Midwest WA to the Goldfields and Yilgarn regions through to the South West and Great Southern.⁴

2.2 Wheat

- **Wheatbelt rail.** Wheat is the major grain crop produced in WA making up 65% of annual grain production and generating \$2-3 billion for the State economy each year. Wheat is moved by Heavy Haul rail on approximately 5,500 km of standard, narrow and dual-gauge rail infrastructure in the southern half of the state. This ranges across harvest collect points from Midwest WA to the Goldfields and Wheatbelt regions through to the South West and Great Southern (Albany and Esperance). WA generates about 50% of Australia's total wheat production with 95% of this exported predominantly to Asia and the Middle East.⁵
- **Two record WA harvests 2021-22 and 22-23.** Co-operative Bulk Handling (CBH) reports the 2022-23 WA harvest is the largest crop ever received at 22.7 million tonnes. This follows the record 2021-22 harvest of 21.3 million tonnes. CBH reports 53 sites breaking receival records. The WA crop is mainly wheat with some barley and canola. This WA record crop occurs as world supply from Ukraine is interrupted. The LDSC WA Rail Industry Advisory Group reported that the train driver shortage means trains are cancelled. Although the rail system set delivery records the 2021-22 record harvest is still being shipped from storage to port in 2023.^{6 7 8}
- **Agricultural Supply Chain Improvement Program.** \$200 million has been funded by the State and Commonwealth Governments under the Agricultural Supply Chain Improvement (ASCI) Program for rail grain handling and loading. ASCI Package 1 upgrades freight rail in the Wheatbelt, Mid-West, Great Southern and Goldfields-Esperance regions to improve transport of wheat plus some barley and canola to international markets as follows:
 - The rail siding upgrade at Brookton in the Wheatbelt is the first of eleven projects. The Brookton rail siding extension has been completed to connect the Co-operative Bulk Handling (CBH) grain bin to the Great Southern Line without congestion of the main line. Worked has commenced at Broomehill to be followed by Moora and Cranbrook. The seven other sites include Avon (Meenaar), Kellerberrin, Dowerin, Konnongorring, Ballidu, Mingenew and Perenjori North. \$60 million has been allocated to upgrade the Midland Rail Line between Carnamah and Mingenew.^{9 10}
 - \$72 million has been allocated for the Narrogin-Kulin-Wickepin Tier 3 rail line Recommissioning Study. Agonis Group will deliver a capital cost estimation of recommissioning the Tier 3 Narrogin-Kulin-Wickepin rail lines. Jacobs Australia will deliver an economic assessment of the project and collate a final report.¹¹

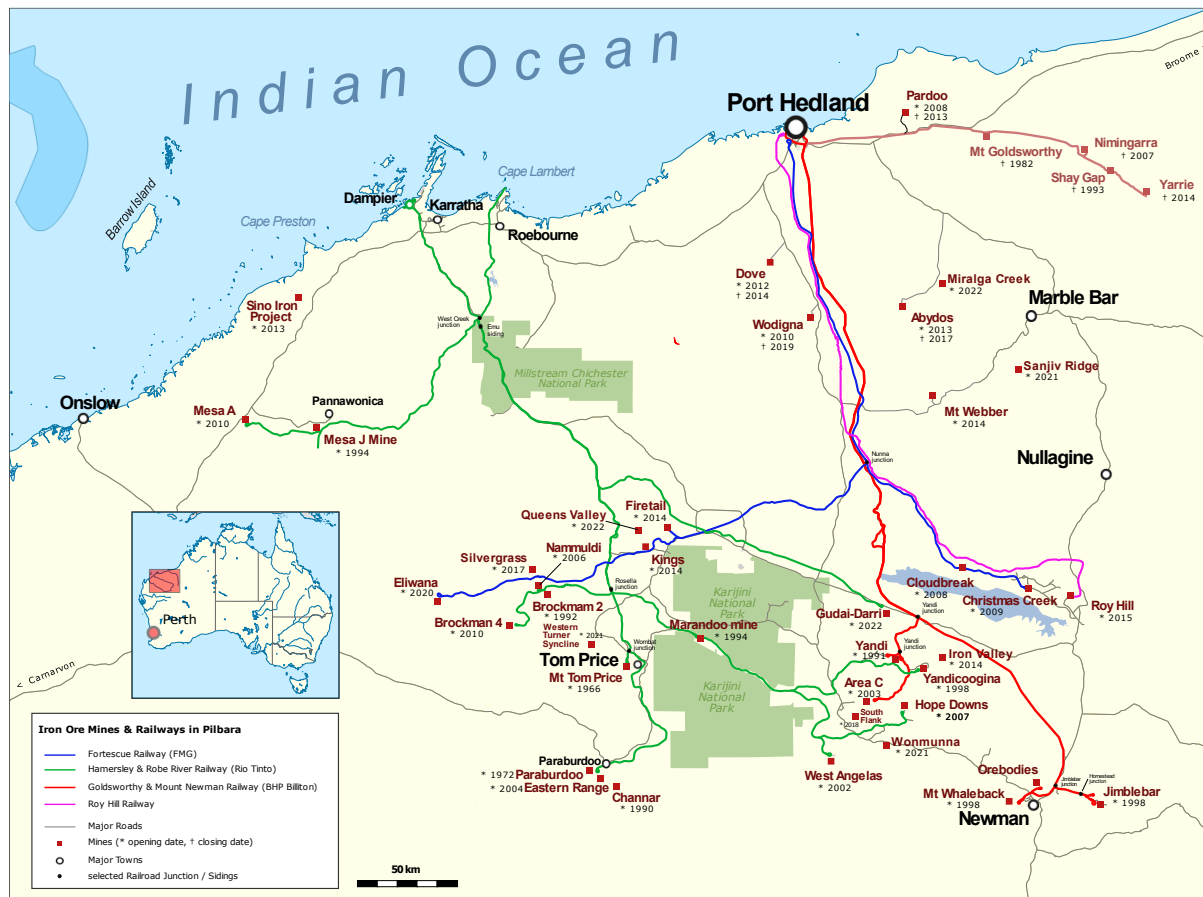
- **Co-operative Bulk Handling rail fleet expansion.** Co-operative Bulk Handling (CBH) opened three competitive tenders in 2022 to purchase standard-gauge and narrow-gauge locomotives plus wagons to expand the current fleet of 25 locomotives and 572 wagons. CBH will buy 17 narrow-gauge CM20ACi dual-cab, diesel-electric locomotives by 2026 from Wabtec Corporation. CBH will purchase 200 standard-gauge and 450 narrow-gauge grain hopper wagons from CRRC Meishan in China. CBH has contracted above-rail operator Aurizon to cart grain to port to 2027 after cancellation of a 10-year contract with Watco six months early.^{12 13 14}



Co-operative Bulk Handling (CBH) train loading grain at CBH Brookton
Credit: Cally Dupe / Countryman 3 Jul 23

2.3 Rail – shipping supply chain

- **WA to East Coast rail link breakdown February 2022.** The WA to East coast rail supply chain breakdown of February and March 2022 illustrated the importance and profile of freight rail. Flooding destroyed 18 sections across a 300 km length of the WA to East coast rail link in remote areas. The logistics supply chain affected stock in shops. This was a high profile media event. Some large companies hired shipping. The repairs took three weeks.
- **WA Shipping and Supply Chain Taskforce.** The WA Government formed a Shipping and Supply Chain Taskforce to examine the state shipping industry and supply chains that link WA with the east coast and international customers. This was in response to the cutting of the East-West rail link by floods in February 2022. The WA Shipping and Supply Chain Taskforce reported in quarter 4 of 2022. The Taskforce recognized the maritime supply-chain factors are global and national. The discussion paper emphasised that maritime training is not working and solutions must be coordinated with the Commonwealth. The Taskforce deferred to the subsequently established Australian Government Strategic Fleet Taskforce.¹⁵
- **Australian Government Strategic Fleet Taskforce.** The Australian Government Strategic Fleet Taskforce will report in quarter 4 of 2023 on the establishment of an Australian Maritime fleet of 12 Australian-flagged and crewed vessels. Obviously shipping relates to ports and port infrastructure interfaces with rail. Naturally WA training and migration policy for rail and maritime requires coordination with Commonwealth policy for success in the global market.¹⁶



2016 map of iron ore mines in the Pilbara region by Peter Christener, Australia. ¹⁷

2.4 Iron ore

- Iron ore exports.** Three WA ports dominate Australian iron ore exports: Port Hedland, Dampier and Cape Lambert. The upstream logistics chain to port is Heavy Haul rail using high-volume dry bulk trains. Port Hedland is the largest bulk export port in the world. WA ore and mineral export is growing. The ports of Esperance and Geraldton are expanding iron ore exports. Growth requires infrastructure and efficient logistic chains. Expansion drives rail and port integration: additional jetties and berths for larger vessels, integrated rail-port yards for blending ore stocks, channel dredging, higher-capacity ship loader equipment, new railways and longer trains.
- Pilbara mine to port rail.** Pilbara railways run with trains hauling up to 33000 tonnes of ore. Early Pilbara lines carry trains hauling around 9000 tonnes. These trains are 2.5 km long with the heaviest wagons in the world carrying 130 tonnes of ore per wagon. Rio Tinto trains are autonomous driven by operators in control rooms in Perth. New railways, electronic signalling, new and longer passing loops, double and triple tracking have increased Heavy Haul rail capacity. The major mining companies in the Pilbara aim for an integrated logistics chain from mine to port via rail. The mining companies control logistics to wharf side. At wharf side actions must be integrated with port users and the port authority to conform with legal requirements. ~~For example autonomous trains must be handed over to a driver.~~
- Liquefied natural gas.** Note that rail carriage of liquefied natural gas (LNG) is minimal. Transfer is generally by pipeline with offshore processing. Increasing exports of LNG from reserves in WA have little impact ports and shipping rather than rail.

- **Pilbara iron ore railways.** Virtually all Pilbara ore goes to port by train. The iron ore loaded at Port Hedland is mined predominantly by BHP Billiton and Fortescue. Mines are up to 425 kilometres from the port. The railways are owned by the mining companies or joint-venture companies who operate the trains directly or via subsidiaries. A summary of Pilbara iron ore railways is:
 - BHP Billiton Goldsworthy Railway from Yarrie and Newman Railway from a range of mines including Mac and Newman Hub to Port Hedland
 - Fortescue Christmas Creek Railway and Fortescue Hamersley - Solomon Railway to Port Hedland
 - Hancock Roy Hill Railway to Port Hedland
 - Rio Tinto Rail to Dampier and Cape Lambert.
- **Western Australia Iron Ore.** Western Australia Iron Ore (WAIO) is an example of an integrated BHP logistics system. There are four processing facilities and five mines connected by 1,000 kilometres of rail infrastructure. WAIO comprises a BHP 80 million tonnes per annum Pilbara iron ore mine called South Flank plus the neighbouring BHP Mining Area C. This forms the largest operating iron ore hub in the world producing 145 million tonnes of iron ore per year. Train drivers and rail infrastructure maintenance crews will be required to deliver iron ore from pit to port over a pit lifecycle of 25 years.¹⁸
- **Pilbara network upgrades.** The landside logistics infrastructure has been upgraded to expand capacity. BHP Billiton has substantially double-tracked the Newman Railway. Fortescue has double-tracked around 39 per cent of its Port Hedland – Christmas Creek Railway. Atlas Iron has been exploring new rail construction with Aurizon plus use of the Fortescue Railway network to replace road haulage from the Pardoo Mine 75 km east of the port and the Wodgina Mine 100 km south. Atlas uses the Port Hedland Utah Point common-user berth. Atlas shipped around 5.6 million tonnes of iron ore in 2011–12.
- **Port Dampier.** Rio Tinto Hamersley Iron moves iron ore by railway to Port Dampier from Paraburdoo. There are branches to other iron ore mines including Yandi, Hope Downs (a Rio Tinto joint venture with Hancock), Brockman No.4 mine, West Angelas and Mt Tom Price. The landside movement of the iron ore occurs entirely on the Rio Tinto Hamersley Iron Railway. Hamersley Iron Railway trains are 2.5 km long. Each train carries around 26000 tonnes
- **Geraldton.** The rate of iron ore export from Geraldton is increasing. The Karara Iron Ore Project is a joint venture between Gindalbie Metals and Ansteel. A new port terminal rated at 16 million tonnes per annum was built at Geraldton to accommodate export traffic. The Karara project has involved constructing an 85 km railway between the existing Brookfield rail network at Morawa and the mine site at Karara. That project underpinned the Brookfield rail upgrade of the Midwest railway between Morawa and the Geraldton.
- **Esperance.** Iron ore is exported through Esperance from the Koolyanobbing mining operations in the Yilgarn Region by Cliffs Asia Pacific Iron Ore. Current iron ore exports of 9 million tonnes per annum form three quarters of the port throughput. Iron ore is transported to the port by railway via the Koolyanobbing - Kalgoorlie (interstate - Eastern Goldfields) and Kalgoorlie - Esperance Railways. Track renewals and additional passing loops have been undertaken. Train length has been increased from 126 wagons to 159 wagons.¹⁹

- **Esperance Branch Line infrastructure upgrade.** The Esperance Branch Line Stage 3 maintenance program led by Arc Infrastructure aims to move freight off road to rail. The 400 km single-line railway carries iron ore, fuel and grain from Kalgoorlie to port at Esperance, WA. The upgrade of the 1930s track reflects the increased freight tonnage of exports from WA.²⁰



Esperance to Kalgoorlie Branch Line upgrade led by Arc Infrastructure
Photo credit Rail Express ²¹

2.5 METRONET and WA Government initiatives

- **METRONET.** The 15 METRONET passenger rail projects form the single largest investment in WA public transport. Statistics include 72 km of new passenger rail and 22 new stations with 8000 hectares of land developed around new stations. Workforce shortages have been acute. Rail stakeholders agree that the training window in WA for railway construction has passed. Experts concur that WA training and migration should focus on the maintenance and operations occupations that will exist over the next 10 to 15 years to service the lifecycle of the 15 METRONET projects beyond construction.
- **Forrestfield-Airport Link.** An example of one METRONET project is the Forrestfield-Airport Link or Airport Line opened 2022. The \$1.86 billion Forrestfield-Airport Link is jointly funded by the Australian and WA governments. The new rail service to the eastern suburbs will have three new stations at Redcliffe, Airport Central and High Wycombe. The \$625 million contract for the Byford Rail Extension has been awarded to MetCONNx Alliance to connect Perth to Serpentine - Jarrahdale. The \$701 million Victoria Park-Canning Level Crossing Removal contract has been awarded to the Armadale Line Upgrade Alliance (Acciona Construction, BMD Constructions, WSP and AECOM). Other projects include the Thornlie to Cockburn spur line, the Yanchep Rail extension and the Ellenbrook line.

- **Strong bounce back in Transperth patronage.** Transperth patronage in February 2023 was the highest monthly total for three years. Total boardings on Transperth buses, trains and ferries reached 11.1 million. This was the best patronage total since 12.2 million in February 2020 before COVID cut public transport use world-wide. Based on daily SmartRider tags Transperth patronage has been at 90-95 per cent of pre-COVID levels for most of 2023.²²
- **Henderson region developments.** The WA Government has Defence industry projects in the Henderson region that will influence integrated rail freight links:
 - **Westport.** Westport is the proposed container port in Kwinana with integrated road and rail networks.
 - **Defence West support to the Naval Shipbuilding Plan and AUKUS-SSN.** Defence West planning will need to include rail integration in the Defence supply chain for construction, operation and maintenance in the Naval Shipbuilding Plan including AUKUS-SSN.
 - **Australian Marine Complex dry dock development.** Rail integration will need consideration in the Defence supply chain for dry dock development at the Australian Marine Complex, Henderson and related to growth of HMAS Stirling as a Royal Australian Navy regional maintenance hub.
 - **The Western Trade Coast.** The Western Trade Coast Global Advanced Industries Hub is a 3,900 hectare heavy industrial area between Munster and Rockingham.²³ The concept is to connect the infrastructure to support mineral processing, chemical manufacture, energy generation, renewable hydrogen processing, advanced fabrication, manufacturing, defence and shipbuilding capabilities across the developing investments at:
 - the Kwinana Industrial Area services
 - the Rockingham Industry Zone services
 - the Australian Marine Complex services
 - the Latitude 32 Industry Zone.

2.6 Workforce challenges

- **WA Rail skills shortage.** There is an appetite in WA rail stakeholders for training partnerships generated by the acute and persistent rail workforce shortages and booming rail business. The supply of rail workforce is weak due to the fragmented rail workforce training pipeline in WA.
- **National Rail Action Plan.** In 2020 State and Federal transport Ministers agreed to implement the [National Rail Action Plan](#). Strategically \$155 Billion has been allocated. Planning has made the Government aware that there is no trained workforce to build \$155 Billion of rail infrastructure nor the trainers to train them. Ministers approved the formation of a *National Rail Skills Hub to co-ordinate between state academies and industry initiatives to improve access and pathways to current and future rail skills needed to build and operate the national rail network*. The proposed Rail Skills Academy is part of this National Rail Skills Hub. The National Rail Action Plan aims for rail harmonisation and standardisation across Australia. It is important to note that WA is a leader in automation and does not have the legacy mechanical signalling systems that will influence the national harmonisation decisions.

- **National Rail skills shortage.** The Australasian Railways Association is investigating a national approach to alleviate the skills shortage and mobility constraints. The rail sector was already facing workforce shortages for infrastructure and maintenance roles prior to COVID-19 to meet the Commonwealth and State investment in the [National Rail Action Plan](#).²⁴ The acute rail skills shortages faced by WA are national rail shortages inside national public infrastructure shortages. The [2022 Infrastructure Market Capacity report](#) states on page 63:

*The workforce demand for major public infrastructure will peak at almost 306,000 in 2023, close to double the demand in 2020 and triple the demand in 2016. This is exacerbated by smaller public infrastructure projects; these usually require about 70,000 workers but will require between 120,000 and 140,000 for the next two years, pushing public infrastructure pipeline demand up to a peak of 442,000.*²⁵

- The Australian Railways Association identified an acute shortage in the following rail occupational groups [ARA-Skills-Capability-Study.pdf](#) WA stakeholders add the occupation Track Protection Officer. Noting that Network or Train Controller traditionally develops from the occupations Train Driver and Track Protection Officer.²⁶
 - Track Inspector
 - Train Driver
 - Track Worker
 - Electrical Technician
 - Signal Technician
 - Rail Engineers (Electrical, Mechanical, Signalling)
 - Network or Train Controller
 - Telecommunications Trades
 - Track Protection Officer (WA acute shortage)
- **Rail Industry Worker program.** The Rail Industry Worker Program (RIW) is a national competency management framework for rail worker compliance. Participant organisations have visibility of the regulatory and compliance requirements of workers moving between projects. The RIW is owned by the Australian Railways Association.²⁷
- **The Seamless Future Rail Skills project.** On 29 Mar 22 the Australian Industry Standards launched the Seamless Future Rail Skills project with 30 rail training pathways open for public consultation www.futurerailskills.org.au²⁸. The project was in response to the Infrastructure and Transport Ministers committing to creating the National Rail Skills Hub (NRSB) to co-ordinate between state academies and industry initiatives to improve pathways to the rail skills needed to build and operate the national rail network.
 - Railway Track Plant Operator
 - Track Vehicle Machine Operator
 - Rolling Stock Maintainer
 - Cable Jointer
 - Cable Jointer (Underground)
 - Tramway Track Worker
 - Possession Protection Officer
 - Protection Officer Level 2/3
 - Protection Officer Level 4
 - Rail Infrastructure Worker
 - Rail Safety Officer

- **Legacy workforce constraints due to COVID-19.** WA rail freight operations increased during COVID-19. Factors included increased grain harvests, increased world grain demand, the high price of iron ore and minerals. WA resource companies increased production in response to global market demand. WA border closures stopped both the standard FIFO movement of Heavy Haul rail workers and the national company transfer of technicians between rail projects across the construction, operation and maintenance phases. The workforce shortage caused a recalibration of the METRONET construction timeline. WA rail companies re-deployed trainers and assessors into operational roles to mitigate capacity constraints. This training program suspension has left a gap in the trainee pipeline. The situation is dynamic. There is a high profile shortage of Train Drivers. The shortfalls in trainers and assessors is a National and State issue across all roles in rail infrastructure, maintenance and rail driving operations.

2.7 Supply and demand for workforce

- **Attraction and retention of workers.** In the competition for skilled rail labour a merry-go-round has developed in WA as workers rotate between companies. Companies with in-house training blame the companies without training. The solution is to address the overarching skills shortage
- **Ageing workforce.** The WA cohorts of ANZSCO 731311 Train Drivers and Rail Trainers and Assessors (ANZSCO 242211 Vocational Education Teacher) are aging out.
- **Rail Trainers and Assessors (ANZSCO 242211 Vocational Education Teacher).** All WA companies are aware of the acute shortage of trainers to replace the current trainer cohort that is aging out over the next seven years. Stakeholders see the reality that there is no training pathway without trainers. There is a limited number of RTOs in WA that provide rail training. Trainers and Assessors are recruited in house but take-up is weak. The TAE40116 Certificate IV Training and Assessment is seen as an obstacle. During COVID-19 border restrictions some companies transferred trainers back on rail operations due to staff shortages. Organisations have reported a minimum of three years to prepare a competent Trainer in Perway welding. Two large WA companies stated they have only one experienced Rail Trainer - Assessor.
- **Housing and Remote Lifestyle.** Non market factors affect recruitment for Heavy Haul rail in the Pilbara. Factors are a lack of affordable housing, rental shortages, remoteness and lack of childcare services. Initiatives in WA regions are well-documented. Metropolitan lifestyle naturally gives mature professionals access to housing, childcare and tertiary education options that match income. This creates FIFO. State Government efforts to support regional day-care and housing are acknowledged but the pros and cons of FIFO are well known. Two rail companies reported housing issues in Northam as a barrier.
- **Under-utilised or latent capacity.** Large enterprises in the Pilbara conduct successful local recruitment campaigns for rail workers. Companies are aware of the value of local workforce for stability and value in contrast to FIFO. Companies have targeted Indigenous groups, females, schools and under-utilised groups as entry level Rail Shunters. For example in 2021 BHP launched a three year program to qualify 200 Train Drivers with entry as Rail Shunter.
- **Employment of Defence veterans.** WA does not have a high-level of transitioning service personnel compared with regions that have large Defence formations like Queensland or the Northern Territory. The largest concentration of Defence veterans in WA is in Rockingham vicinity Fleet Base West. This workforce has maritime skills founded on RAN veterans. Working Spirit and RSLWA have established a Veterans Employment Program to connect companies and Defence veterans funded through the State Government Anzac Day Trust Grants. BHP have established an engagement partnership with Defence in WA.^{29 30}

2.8 Technology and innovation

- **Autonomous trains.** WA is a world leader in remote autonomous Heavy Haul train technology. Rio Tinto operate autonomous Heavy Haul trains in the Pilbara controlled from screens in Perth. At a micro level these autonomous trains require three back up communication systems for safe operation: GPS/satellite, Data and Broadband. The Train Controllers in Perth require maintenance and fault finding systems. For example flying a drone 5 km out and back along a halted 2.5 km iron ore train to inspect the air brake hoses. Then despatching a manual repair team. Autonomous trains will affect the rail occupations for operators, drivers, shunters, maintainers, network controllers and train controllers. As in all areas of automation there will be developments regarding legal procedures. For example ~~currently autonomous trains are handed over to drivers at the Pilbara Ports Authority. These~~ legal developments will affect all suppliers in the Integrated Logistics Chain of responsibility.
- **Transition to electronic signals.** The move to automation will be a transition for occupations and technology. The investment in supporting infrastructure makes immediate full automation expensive. An example at micro level is Heavy Haul locomotives: drivers are transitioning from signal lights on the track to signals on the dashboard in the cab. This saves outdoor signal maintenance costs in remote areas but requires investment in electronic signalling technology. This communications based train control (CBTC) signalling will affect the rail occupations for operators, drivers, shunters and maintainers. Electronic signalling will develop to fault finding and repair teams call out. Control room coordination of signalling will influence train scheduling through data analysis.
- **Infrastructure Diagnostic Vehicle.** The WA Public Transport Authority operates a \$14.3 million Infrastructure Diagnostic Vehicle (IDV). The IDV travels the network replacing visual inspections. The IDV operators monitor data in the IDV Vehicle to predict failures and target repairs. The operators role is an example of data and technology skills moving into the occupation 821611 Railway Track Worker.
- **Mechatronic, Electronic and Telecommunications jobs.** The integration of mechanical, electronic and electrical engineering systems as 'mechatronics' is creating crossover in the traditional mechanical and electrical occupations of Level 1 engineers and supporting Technicians. Advances in electronic signalling technology has developed the rail jobs 'Signal Technician' and 'Communications Technician'. Rail companies are using the following ANZSCO occupation codes for training and migration:
 - 341111 Electrician (General) for Rail Signal Technicians and Rail Signals Supervisors / Superintendents
 - 313214 Telecommunications Technical Officer for Rail Communications Technical Officers
 - 313211 Radiocommunications Technician for Rail Communication System Technicians (Trades)
 - 312312 Electrical Engineering Technician for Rail Electrical Rollingstock Technicians
 - 312512 Mechanical Engineering Technician for Rail Mechanical Rollingstock Technicians
 - 342211 Electrical Linesworker for Public Transport Authority Passenger Rail Overhead Line Equipment (OLE) Supervisors / Superintendents and Passenger Rail Linespersons (Overhead)
 - 263311 Telecommunications Engineer for Rail Engineer

- 263312 Telecommunications Network Engineer for Rail Engineer
- 342414 Telecommunications Technician for Rail Network Technician
- **Cyber security.** The WA automatic rail network is an international cyber target. Rail companies are moving to automation, digitisation and 'systems thinking'. In rail terminology that is electronic signals, interlocking systems, autonomous trains and train control systems. WA iron ore is a high value target. Iron ore accounted for 85% of State government royalty revenue and 25% of general revenue in 2021-22. Port Hedland exported 61% of WA iron ore sales by volume in 2021-22. WA accounted for 38% of global iron ore supply in 2022. Private companies FMG, BHP and Rio Tinto alone operate over 2000 kilometres of remote rail network in WA. The electronic systems that support these commodities are Cyber targets. The risks are criminal manipulation of the share price or state actor grey zone warfare. These systems are of strategic value and require cyber defence coordinated at Commonwealth level.
- **Automation technology in an integrated logistics system.** There is pressure in the international market to move to automation. Automation technology employs 'systems thinking' at macro level across an Integrated Logistics System (ILS). The ILS concept is that autonomous machines mine and load ore onto autonomous trains. Autonomous trains move to ports with automated unload and load onto unmanned ships. ~~Functioning examples of port automation technology are Port Botany, NSW and Victoria International Container Terminal, Victoria.~~ The Cargo Movement Coordinating Centre controls the loading and unloading of the shipping, road and train network strategically to create an Integrated Logistics System. Operationally sensors control vehicle and container movement. Remote vehicles require back-up communications across broadband, data and satellite. Long term data analytics provide predictive information to plan vessel, train and vehicle marshalling, scheduling and routing. Developments of the systems thinking are underway in WA with 2.5 km autonomous ore trains controlled from centres in Perth. The legal consequences are an important consideration. For example the Chain of Responsibility, currently autonomous trains are handed over to drivers at the Pilbara Ports Authority. Functioning examples of port automation technology are Port Botany, NSW and Victoria International Container Terminal, Victoria. At Port Botany the port Stacking Yard and Ship Load-Unload cranes are automatic but the trucks and trailers have a driver.
- **Big Data analysis.** Systems will generate short and long term data. Data analytics will provide predictive information. For example to plan train, vessel and vehicle marshalling, scheduling, routing and maintenance. The Advanced Train Management System (ATMS) is a functioning example of progress to systems thinking and big data analysis.
- **Multi-tasking in modern industry practice.** Rail stakeholders agree there is crossover of traditional rail occupations in the modern track team. Technology has developed from the traditional mechanical signals to modern electronic signalling and telecommunications. This requires data analysis and computer literacy. For example Public Transport Authority track teams must be able to operate Supervisory Control and Data Acquisition (SCADA), Communications Based Train Control (CBTC), European Train Control System (ETCS) and European Rail Traffic Management System (ERTMS). Public Transport Authority track teams require electrical skills relating to locomotives, rollingstock, power, overhead line and network control. Train controllers now work at a desktop in a control room carrying out tasks that were once with the rail track teams. The LDSC WA Rail Industry Advisory Group felt that with emerging occupations in rail and multi-tasking in modern industry practice there is crossover between three ANZSCO codes who work together in the Rail track teams:
 - 821611 Railway Track Worker
 - 721914 Railway Track Plant Operator

- 712917 Railway Signal Operator
- **The Rail ANZSCO codes need review to current industry practice.** Rail Stakeholders agree the 821611 Railway Track Worker code is too broad for the range of roles that have emerged in rail. The outdated descriptions are affecting supply of workers. For example the code covers separate occupations of Rail Maintainer, Track Inspector and Signal Maintainer. Stakeholders considered the three codes above have stated ANZSCO job roles that vary from Skill level 4 to Skill level 2. The Track Inspector or the Possession Officer discharges duties at a much higher level than Railway Track Worker. Rail Signal Operator covers emerging occupations in Rail electronic signalling and rail communications that are electronic or electrical technicians at Skill level 1. Automation increasingly makes Railway Signal Operator a task of the modern 712918 Train Controller. The three codes need review to clarify where Rollingstock Technicians are classified for both electrical and mechanical maintenance.
- **ANZSCO occupation code review.** WA Stakeholders agree there needs to be participation in the ANZSCO national review of occupation codes for rail. This ANZSCO review of the rail occupation codes will support training and migration policy for the current acute and persistent workforce shortages. Review of the ANZSCO occupations codes for traditional rail occupations is Round 3 from 1 Nov 2023 to 27 Feb 2024. Rail stakeholders acknowledge that technological developments mean that ANZSCO codes for Rail Signals and Rail Communication Technician will have to be reviewed in Consultation Round 2 under Telecommunication or Electricity, gas, water and waste services from 15 Jun to 6 Sep 2023¹.

3. Environmental, social and governance

- **Climate change.** The Commonwealth is committed to reduce greenhouse gas emissions 43% by 2030 under the Paris Agreement. The WA State Government target is net zero greenhouse gas emissions by 2050. Governments and corporations follow environmental policies to comply with environmental law and promote an image of social responsibility. Private corporations act to protect shareholder value and support investors.
- **Sustainability strategy information pack.** The WA government has published the *Western Australia's Environmental, Social and Governance (ESG) Industry Information Pack*³¹ An example of a rail sustainability strategy is the METRONET Sustainability Strategy.³² A Sustainability Strategy or ESG proposition' may include:
 - Environmental (E) criteria such as climate change, carbon emissions, energy use, renewables, green technology, waste, recycling, decommissioning and resource use
 - Social (S) factors like community relationships, reputation, labour relations, indigenous policies, diversity and inclusion
 - Governance (G) covers the procedures to make effective decisions to comply with the law and relate to stakeholders.
- In July 2023 the WA government has published a Climate Adaptation Strategy called Building WA's climate resilient future.³³
- **Decarbonisation and carbon neutral trains.** International companies are under market pressure adopt carbon neutral practices. Resource sector companies aim to decarbonise Heavy Haul rail with hybrid locomotives using solar-charged batteries and alternate fuels. For example

¹ Submission date changed from 6 Sep 23 to 11 Aug 23

research by Dr Ruth Knibbe and Professor Paul Meehan from The University of Queensland School of Mechanical and Mining Engineering with rail freight operator Aurizon found a combination of batteries and hydrogen fuel cells could feasibly replace diesel power.³⁴

- **Battery-powered solar-charged locomotives.** Battery-powered solar-charged locomotives are under trial for remote rail in the Pilbara. Note that remote electric rail requires different engineering to metropolitan electric passenger rail. For example there is no overhead power cable. Solar charging will require new infrastructure and maintenance routines for batteries and recharge systems. For economy of scale hybrid systems will be developed parallel with electric truck fleet management and alternate fuels.
- **Alternate fuels.** Alternate fuels like hydrogen and ammonia are under development. Trials of hydrogen for Heavy Haul road vehicles are progressing in the Pilbara. The WA Government has committed \$160 million under the WA Renewable Hydrogen Strategy. Specifically the Yuri Project renewable hydrogen plant will be built at Murujuga near Dampier in the Pilbara with ENGIE to supply the Yara Pilbara Ammonia Fertiliser facility. An example of testing hybrid electric-hydrogen passenger locomotives is in Spain on the Zaragoza to Canfranc line in the Pyrenees. As with all alternate fuels it is investment in the supporting logistic infrastructure that is critical. In the Spanish trial Iberdrola provides green hydrogen fuel from a plant in Barcelona, Ercros provides green hydrogen fuel from a plant in Sabiñanigo and Shei-Arpa provides a high-pressure hydrogen fuelling system.^{35 36}

4. Rail training

4.1 Training opportunities

- **WA is a leader in remote Heavy Haul rail.** WA a world leader in autonomous trains, electronic signalling and mine to ship integrated logistics systems. This world leadership in remote Heavy Haul rail generates demand for technical rail skills for engineering, electronics, computing, cyber, communications, systems analysis and data analysis.
- **Rail training appetite.** WA has an opportunity to lead in rail training. There is an appetite in WA rail stakeholders for partnership and collegiate action on training generated by the acute and persistent rail workforce shortages and booming rail business. For example partnerships with TAFE and the establishment of a WA Rail Skills Academy as part of the National Rail Skills Hub recommended by the National Rail Action Plan 2020.
- **Industry and education.** Rail training needs a track, rolling stock and locomotives. Rail training therefore requires partnerships to share expensive capital infrastructure. The Naval Shipbuilding Plan, METRONET and the construction of remote Heavy Haul railways are creating competition for a small graduation of engineers and supporting technicians. There needs to be a coordinated training plan to generate the engineers and related technicians required by rail, shipbuilding in the Defence Industries, maritime, civil construction and the Heavy Haul rail of the WA resources sector. Naturally migration must be considered as a short term fix. A long term training plan may include:
 - Engineering career pathway information
 - Partnerships with industry and university
 - Internships

- **WA Railcar Program.** The WA Railcar Program was identified as a Strategic Project under the WA Jobs Act 2017. Alstom Australia will manufacture 102 new railcars (17 six-car trains) at the Bellevue Railcar Manufacturing and Assembly Facility. Construction of the \$46 million METRONET Bellevue Railcar Manufacturing Facility commenced in March 2020. In 2023 Three trainees completed the Alstom Aboriginal 10-week pre-employment program to enter three-year apprenticeships on the METRONET WA Railcar Program. The program achieves a Certificate III in Engineering - Mechanical Fitting at North Metro TAFE. Two C-series trains started detailed diagnostic testing on the network in June 2023. The diagnostic training precedes seating and handrails installation and external design application^{37 38 39}
- **Rail Trade Training Centre.** North Metro TAFE is the approved training provider for The WA Railcar Program with industry partner Alstom Australia at the METRONET Bellevue Railcar Manufacturing Facility. Development includes the Rail Trade Training Centre at North Metro TAFE Midland Campus. The intent is to link the Bellevue Railcar Facility with a Rail Trade Training Centre run by North Metropolitan TAFE for apprenticeship and traineeships.
 - **Stage 1.** Stage 1 works completed in October 2020 by M/Construction built rail signalling workshops for electrical rail signalling qualifications. A pilot group of employees from Rio Tinto, John Holland Group and Hitachi commenced a Certificate IV in Electrical Rail Signalling in 2021. It is proposed that holders of a WA electrical licence will be able to undertake a Certificate IV in Electrical Rail Signalling
 - **Stage 2.** The \$5.6 million Stage 2 development included construction of a dual-track level crossing, a maintenance track and crossover, a standalone Signalling Equipment Room for hands-on training in signal equipment and a section of line for training in rail maintenance.⁴⁰
- **Proposed WA Rail Skills Academy.** The Australasian Railways Association is liaising with the WA Government on potential for the Rail Trade Training Centre to relate to the proposed WA Rail Skills Academy nested in Metro North TAFE or Pilbara TAFE. The intent of the National Rail Action Plan is that WA will pilot a Rail Skills Academy. The Australasian Railways Association acknowledge that private providers have a key role in WA rail industry training.
- **Pilbara railcar manufacturing hub.** Rio Tinto has committed \$150 million to a partnership with WA manufacturer Gemco Rail to establish iron ore railcar manufacture and maintenance in the Pilbara. The State Government will commit \$6.9m from its \$15m Local Manufacturing Investment Fund to upgrade the Gemco Rail Forrestfield facility and build a new Karratha hub. Gemco Rail will deliver 40 railcars initially plus 10 per year over the next six years to a total of 100. These will enter the 14,000 strong Rio railcar fleet. The first WA built railcar is expected in 2024. Target opening date of the Karratha-based facility is the end of 2024.^{41 42}

4.2 Training challenges

- **Industry career pathways.** WA rail stakeholders acknowledge a misfit of WA TAFE training to the industry career pathways and the weaknesses of the Apprenticeship - Traineeship system in the WA context. WA rail training needs coordination. WA rail stakeholders look forward to developments in the Rail Trade Training Centre and proposed WA Rail Skills Academy.
- **Institutional Based Training.** The WA rail workforce supply is affected by the fragmented training pipeline in WA. Rail training and assessment requires a track, rolling stock and locomotives. Rail training therefore requires partnerships to share infrastructure. In WA these partnerships are weak. Large WA companies like ARC, John Holland, Aurizon and Public Transport Authority train in-house to TLI27121 Certificate II in Rail Infrastructure and TLI37122 Certificate III in Rail Infrastructure as Enterprise Registered Training Organisations (RTO). WA companies also utilise training from Private RTO like CERTRAIL (Centre For Excellence in Rail Training) and Railtrain.

- **Railway construction Skill set.** The acute rail workforce shortage means that companies are utilising civil contractors with no rail experience for railway construction eg METRONET construction. There is a particular need for a short course relating to the legal requirements for Rail Track Protection Officer and Possession Protection Officer for construction worker safety on a rail network. Companies are hiring separate mechanical and electric contractors from the heavy vehicle / heavy industry sector for Rolling Stock Fitting and Maintenance. These contractors have no rolling stock experience. The traditional rail workshop trades that combined Mechanical and Electrical Fitting are not available. Stakeholders calculate a minimum of 12 months to develop skills for the rail environment before electrical or mechanical fitters can be utilised as rolling stock engineers (passenger), wagon maintainers or diesel mechanics (freight).
- **Rail induction Skill set.** Rail stakeholders see the value of a rail foundation Skill Set to support WA rail industry practice. A central location could teach foundation skills and enterprise knowledge before trainees move to different areas via FIFO work. For example there could be training including:
 - FIFO health and wellbeing
 - risk management and safety tools
 - WHS incident report including harassment
 - radio communications
 - compliance training
 - rail maintenance and mechanical appreciation
 - industry concepts of mine to market, supply chain/value chain
 - industry context, values, pathways and performance management
 - induction / area specific inductions
 - fatigue management
 - units of competency mandated for the Rail Industry Worker card (RIW) such as TLIF0020 Safely access the rail corridor
 - White Card and Rail Industry Worker card
- **Competition for Engineers and supporting technical workforce.** The Naval Shipbuilding Plan, METRONET and the construction of remote railways for Heavy Haul rail are creating competition for a small WA annual graduation of Engineers, supporting technical workforce and construction workforce. There needs to be a coordinated training plan to generate the engineers and related technicians required by the defence industries, maritime supply chain, civil construction, METRONET, Heavy Haul rail and the resources sector. Naturally migration must be considered as a short term fix. A long term training plan may include:
 - Engineering career pathway information
 - Partnerships with industry and university
 - Internships
 - Apprenticeships and Traineeships
 - Institutional Based Training (TAFE and other Training Providers)
 - Pre- apprenticeships and school based traineeships
- **High level specialist rail unit.** Rail stakeholders see the opportunity for a high level specialist rail unit to leverage on WA world leadership in remote Heavy Haul rail, autonomous trains and electronic signalling. The rail specialisation unit in existing Engineer courses could develop to short courses for transition of qualified engineers from other fields. If a Rail Trade Training Centre can be established with North Metro TAFE or Pilbara TAFE then Level 2 course options could be synchronised with Higher Education Engineering courses for a Level 1 pathway.

- **Perception of the industry.** Rail engineering needs to be seen as a genuine career alternative to the mines. WA could utilise its position as a world leader in autonomous and digital rail technology derived from development of the supply chain for the resource sector in the Pilbara. The WA rail industry is poorly branded. In WA the Heavy Haul rail sector is assumed to be part of 'the mines'. This can affect political policy, funding and recruitment. Neither Passenger nor Heavy Haul rail are articulated as career options in Schools, TAFE and Universities. In 2023 the Australasian Railways Association have supported a rail careers expo in WA. Locally Arc Infrastructure have initiated a successful series of school visits via the Department of Training and Workforce Development Year 9 Taster Program.

4.3 Training and migration

- **Apprenticeship - Traineeships.** Rail stakeholders support the current WA Apprenticeship - Traineeships:
 - TLI27121 - Certificate II in Rail Infrastructure⁴³
 - TLI29921 - Certificate II in Rolling Stock maintenance
 - TLI37122 - Certificate III in Rail Infrastructure
 - TLI31421 - Certificate III in Light Rail Driving
 - TLI40921 - Certificate IV in Rail Network Control
 - TLI42622 - Certificate IV in Train Driving
- **Rail skills shortage.** The rail industry requires specific skills. The skills range from professional Level 1 Engineers to Technician through to entry level 821611 Railway Track Worker. The skills required in the rail construction phase are different to the operations and maintenance phases. WA is in a construction phase and has an acute shortage of rail workforce. Stakeholders use temporary, permanent interstate and overseas migration but acknowledge the need for long term training in WA for operations and maintenance long term. See Annex A
- **Recognition of Prior Learning for WA Electrical Licence.** The RPL of Electrical qualifications to the WA Electrical Licence is a particular obstacle to migration of workforce for Rail Signal Technician and Communications Technician.
- **Rail Construction phase.** It is important to emphasise that the construction phases of the 15 METRONET projects and the current construction of remote freight rail networks for iron ore export require specific rail construction occupations that move between railway construction sites. These occupations are mobile. The higher level rail engineers cannot be trained in WA. The required occupations change as these projects mature from construction into maintenance and operations phases of the 15 year project life cycle.
- **Workforce average age continues to rise.** The shortage of skilled rail workers is a persistent issue particularly for engineering, signal operators, train drivers and train controllers. The average age of rail workers in WA continues to rise. Nationally Train Drivers are 48 years and Rail Workers 44.⁴⁴ Skilled workers are retained for longer due to lack of replacements. This retention may be subject to the COVID-19 retirement wave. Employers target a younger cohort through traineeships but there is a long lead time for new entrants to reach competence.
- **Training and migration strategy.** Rail workforce shortage is acute. WA rail stakeholders agree policy must relate to:
 - Long term development of WA rail training including consideration of the WA Rail Skills Academy proposed by the Australasian Railway Association
 - Short term inclusion of rail sector occupations in available migration streams. See Annex A.

KEY POINTS FOR MIGRATION AND RAIL OCCUPATIONS IN WA

- **Migration program ‘not fit for purpose’.** The complexity of migration options open to WA rail companies is classified on page one of the Australian Government Department of Home Affairs, Review of the Migration System as ‘not fit for purpose’.⁴⁵ Current options include but are not limited to:
 - 190 visa
 - 491 Visa
 - WASMOL
 - National Skills Commission Skills Priority List (SPL) reversing removal on 6 Oct 22
 - Medium and Long-term Strategic Skills List (MLTSSL)
 - Short-term Skilled Occupation List (STSOL),
 - Regional Occupation List (ROL)
 - Regional Sponsored Migration Scheme (RSMS)
 - Priority Migration Skilled Occupation List (PMSOL)
 - State Nomination Migration Program through Department of Training and Workforce Development
 - Global Talent visa (through Department of Jobs, Tourism, Science and Innovation)
 - Designated Area Migration Agreements (DAMA)
- **DIDO – FIFO and Migration.** The rail industry uses workforce that is Drive-In-Drive-Out (DIDO) and Fly-In-Fly-Out (FIFO) plus permanent interstate and overseas migration. Factors include the location of remote Heavy Haul rail networks in the Pilbara and the specific needs of workforce in the rail construction phase compared with operations and maintenance. Migration options used by the rail sector include:
 - temporary DIDO
 - temporary FIFO (WA)
 - temporary FIFO (interstate)
 - temporary FIFO (international)
 - permanent interstate migration
 - overseas migration with particular reference to engineers
- **Designated Area Migration Agreements to address regional skilled labour shortages.** Regional Development Commissions like the Great Southern Regional Development Commission and the Pilbara Regional Development Commission can utilise a Designated Area Migration Agreement or DAMA to permit entry of skilled workers to age 55 years above the standard migration 45 year age limit. The Act is not changed. The Minister amended the regulations to permit entry of skilled workers to age 55 years above the standard migration 45 year age limit.
- **Pilbara DAMA example.** The Pilbara Designated Area Migration Agreement (DAMA) lists Electrician 341111 Skill Level 3 for Permanent Pathway and Age Concession if employer sponsored. Skilled Employer Sponsored Regional (SESR) and Employer Nomination Scheme (ENS) subclass 186 visa applicants may be nominated if not turned 55 years of age at the time of SESR or ENS nomination.

5. Your input

- **Why this report?** The WA Government has 8 skills councils to engage stakeholders to advise the State Training Board and the Department of Training and Workforce Development on the training and priorities of industry with particular reference to skills development.
- **Input.** LDSC welcomes input on 08 9388 8781 or <https://www.ldsc.asn.au/contact.html>
- **Industry Advisory Group.** LDSC invites stakeholders to join our Rail Industry Advisory Group 08 9388 8781 or <https://www.ldsc.asn.au/contact.html>

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